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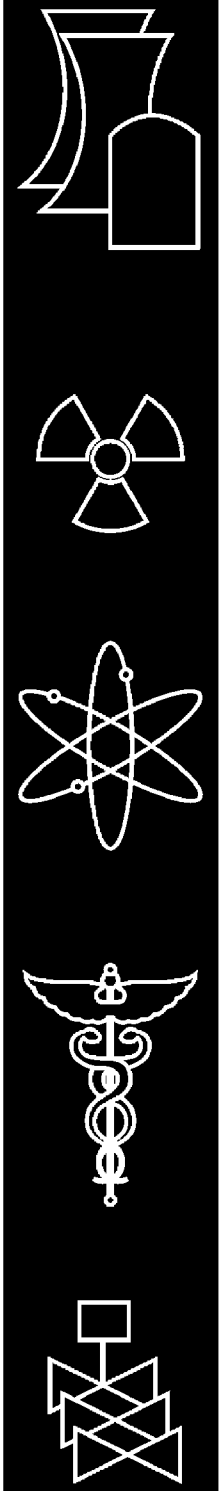

Tensile-Property Characterization of Thermally Aged Cast Stainless Steels

Argonne National Laboratory

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Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems, NUREG/CR–4513, ANL–90/42 (June 1991).

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by

W. F. Michaud, P. T. Toben,
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Abstract

The effect of thermal aging on tensile properties of cast stainless steels during service in light water reactors has been evaluated. Tensile data for several experimental and commercial heats of cast stainless steels are presented. Thermal aging increases the tensile strength of these steels. The high–C Mo–bearing CF–8M steels are more susceptible to thermal aging than the Mo–free CF–3 or CF–8 steels. A procedure and correlations are presented for predicting the change in tensile flow and yield stresses and engineering stress–vs.–strain curve of cast stainless steel as a function of time and temperature of service. The tensile properties of aged cast stainless steel are estimated from known material information, i.e., chemical composition and the initial tensile strength of the steel. The correlations described in this report may be used for assessing thermal embrittlement of cast stainless steel components.

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Nomenclature

b	Uncracked ligament of Charpy–impact specimen (mm).
B	Thickness of Charpy–impact specimen (mm).
E	Modulus of elasticity (MPa).
P	Aging parameter, i.e., the log of the time of aging at 400°C.
P_y	Yield load for an instrumented Charpy–impact test (N).
Q	Activation energy for the process of thermal embrittlement (kJ/mole).
n	Ramberg–Osgood parameter.
R_f	Ratio of the tensile flow stress of aged and unaged cast stainless steel.
R_y	Ratio of the tensile yield stress of aged and unaged cast stainless steel.
t	Service or aging time (h).
T_s	Service or aging temperature (°C).
W	Width of Charpy–impact specimen (mm).
α	Ramberg–Osgood parameter.
ε	Engineering strain.
ε_o	Reference strain in Ramberg–Osgood equation.
θ	Aging behavior at 400°C, i.e., the log of the time to achieve β reduction in impact energy at 400°C.
σ	Engineering stress (MPa).
σ_f	Engineering flow stress (MPa).
σ_o	Reference stress in Ramberg–Osgood equation (MPa).
σ_y	Engineering yield stress (MPa).

SI units of measure have been used in this report. Conversion factors for measurements in British units are as follows:

To convert	to	multiply by
in.	mm	25.4
J*	ft·lb	0.7376
kJ/m^2	$in.–lb/in.^2$	5.71015
kJ/mole	kcal/mole	0.239

* When impact energy is expressed in J/cm^2, first multiply by 0.8 to obtain impact energy of a standard Charpy–V notch specimen in J.

Executive Summary

Cast duplex stainless steels used in light water reactor (LWR) systems for primary pressure–boundary components are susceptible to thermal embrittlement at reactor operating temperatures. Thermal aging of cast stainless steels at these temperatures causes an increase in hardness and tensile strength and a decrease in ductility, impact strength, and fracture toughness of the material and the Charpy transition curve shifts to higher temperatures. Investigations at Argonne National Laboratory have shown that thermal embrittlement of cast stainless steel components may occur within the reactor design lifetime of 40 yr. Various grades and heats of cast stainless steel exhibit varying degrees of thermal embrittlement. In general, the low–C CF–3 steels are the most resistant to thermal embrittlement, and the Mo–bearing, high–C CF–8M steels are the least resistant. An assessment of mechanical–property degradation due to thermal embrittlement is therefore required to evaluate the performance of cast stainless steel components during prolonged exposure to service temperatures, because rupture of the primary pressure boundary could lead to a loss–of–coolant accident and possible exposure of the public to radiation.

This report presents tensile–property data on several heats of cast stainless steels aged up to 58,000 h at temperatures between 290 and 450°C (554 and 752°F). The tensile data are analyzed to establish the effects of thermal aging on tensile strength and engineering stress–strain behavior (represented by the Ramberg–Osgood equation) of cast stainless steels. A procedure and correlations are presented for predicting the change in tensile flow and yield stress, and in the engineering stress–vs.–strain curve of cast stainless steel components due to thermal aging during service in LWRs. The tensile properties of aged cast stainless steel are estimated from information that is readily available from certified material test records for the component, i.e., chemical composition and the initial tensile strength of the unaged material. The correlations described in this report may be used for assessing thermal embrittlement of cast stainless steel components.

1 Introduction

Cast duplex stainless steels used in light water reactor (LWR) systems for primary pressure–boundary components, such as valve bodies, pump casings, and primary coolant piping, are susceptible to thermal embrittlement at reactor operating temperatures, i.e., 280–320°C (536–608°F). Thermal aging of cast stainless steels (i.e., ASTM Specification A–351 for Grades CF–3, CF–3A, CF–8, CF–8A, and CF–8M*) at these temperatures causes an increase in hardness and tensile strength and a decrease in ductility, impact strength, and fracture toughness of the material and the Charpy transition curve shifts to higher temperatures. An assessment of mechanical–property degradation due to thermal embrittlement is therefore required to evaluate the performance of cast stainless steel components during prolonged exposure to service temperatures, because rupture of the primary pressure boundary could lead to a loss–of–coolant accident and possible exposure of the public to radiation.

Investigations at Argonne National Laboratory (ANL)[1–10] and elsewhere[11–16] have shown that thermal embrittlement of cast stainless steel components occurs during the reactor design lifetime of 40 yr. Various grades and heats of cast stainless steel exhibit varying degrees of thermal embrittlement. In general, the low–C CF–3 steels are the most resistant to thermal embrittlement, and the Mo–bearing, high–C CF–8M steels are the least resistant.

A procedure and correlations have been developed at ANL for estimating mechanical properties of cast stainless steel components under LWR operating conditions from material information readily available in certified material test records.[5] These correlations were later updated and optimized with an expanded data base and mechanical–property results obtained from cast stainless steels that were aged up to ≈58,000 h at 290–350°C (554–662°F).[6,7] The results are expressed in terms of engineering fracture toughness parameters that can be used in fitness–for–service analyses, e.g., "NRCPIPE" computer code for analyzing elastic–plastic fracture mechanics of nuclear power plant piping. However, correlations for estimating tensile stress–strain behavior of thermally aged cast stainless steels have not been developed.

This report presents tensile–property data on several heats of cast stainless steels aged up to 58,000 h at temperatures between 290 and 450°C (554 and 752°F). The results are analyzed to establish the effects of thermal aging on tensile strength and engineering stress–strain behavior, represented by the Ramberg–Osgood (RO) equation, of cast stainless steels. A procedure and correlations are presented for estimating tensile flow and yield stress and RO parameters of aged cast stainless steel from known material information, i.e., composition and initial tensile strength of the unaged material.

2 Mechanism of Thermal Embrittlement

Thermal embrittlement of cast duplex stainless steels results in brittle fracture associated with either cleavage of ferrite or separation of the ferrite/austenite phase boundary. Thermal aging of cast stainless steels at temperatures <500°C (932°F) leads to precipitation of additional

* In this report, Grades CF–3A and CF–8A are considered equivalent to CF–3 and CF–8, respectively. The A designation represents high tensile strength. The chemical composition of CF–3A and CF–8A is further restricted within the composition limits of CF–3 and CF–8, respectively, to obtain a ferrite/austenite ratio that results in higher ultimate and yield strengths.

phases in the ferrite, e.g., formation of a Cr–rich α' phase by spinodal decomposition; nucleation and growth of α'; precipitation of a Ni– and Si–rich G phase, $M_{23}C_6$ carbide, and γ_2 austenite; and additional precipitation and/or growth of existing carbides at the ferrite/austenite phase boundaries.[1,2,8–10,17–21] Thermal aging has little or no effect on the austenite phase. The formation of Cr–rich α' phase by spinodal decomposition of ferrite is the primary mechanism for thermal embrittlement. The α' phase strengthens the ferrite matrix, i.e., it increases strain hardening and local tensile stress, so that the critical stress level for brittle fracture is achieved at higher temperatures.

The degree or extent of thermal embrittlement is controlled by the amount of brittle fracture, which depends on both material and aging conditions. In some cast stainless steels, a fraction of the material may fail in brittle fashion but the surrounding austenite provides ductility and toughness. Such steels have adequate impact strength even after long–term aging. Predominantly brittle failure occurs when either the ferrite phase is continuous, e.g., in cast material with a large ferrite content, or the ferrite/austenite phase boundary provides an easy path for crack propagation, e.g., in high–C or high–N steels that contain phase–boundary carbides or nitrides. Consequently, the amount, size, and distribution of ferrite in the duplex structure and phase–boundary precipitates are important parameters that control the extent of thermal embrittlement. The decrease in room–temperature (RT) Charpy–impact energy during thermal aging at 400°C (752°F) of various heats of cast stainless steel[4–6,11,15,16] is shown in Fig. 1. The results indicate that all the materials reach a "saturation" RT impact energy, i.e., a minimum value that would be achieved by the material after long–term aging. The actual value of the saturation RT impact energy for a specific cast stainless steel is independent of aging temperature but depends strongly on the chemical composition of the steel; it is lower for the Mo–bearing CF–8M steels than for the Mo–free CF–3 or CF–8 steels, and decreases with an increase in ferrite content or the concentration of C or N in the steel.

The time to reach saturation, i.e., the kinetics of thermal embrittlement, depends on both material and aging parameters. Figure 1 indicates that the time for aging at 400°C for a given decrease in impact energy varies by more than two orders of magnitude for the various heats,

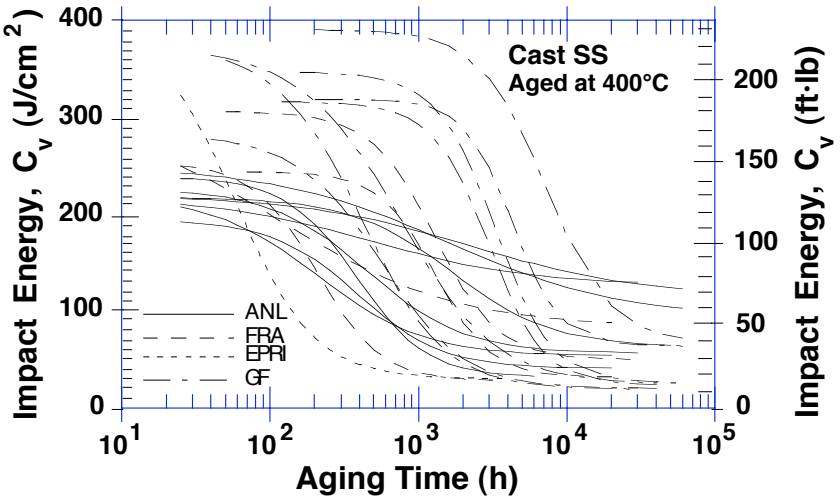


Figure 1. Decrease in Charpy–impact energy for various heats of cast stainless steels aged at 400°C. FRA= Framatome, EPRI= Electrical Power Research Institute, GF= Georg Fischer Co.

ANL and Framatome (FRA) heats, and 10,000–30,000 h for the Georg Fischer Co. (GF) heats. Activation energies of thermal embrittlement range from 65 to 230 kJ/mole (15 to 55 kcal/mole).[4–6,11,13–15,22] These values are well below the 202 kJ/mole (48 kcal/mole) value associated with Cr bulk diffusion in the Fe–28Cr alloy.[23] Small changes in the constituent elements of the material can cause the kinetics of thermal embrittlement to vary significantly. The logarithm of the aging time at 400°C for a 50% reduction in RT Charpy–impact energy has been shown to be an important parameter for characterizing the kinetics of thermal embrittlement.[5,6]

Activation energy is high for steels that show fast embrittlement at 400°C and low for those that show slow embrittlement at 400°C. Also, materials with the same chemical composition but differing heat treatment show different kinetics of embrittlement.[11] Microstructural examination of aged cast stainless steels suggests that slow embrittlement at 400°C and low activation energy are associated with clusters of Ni–Si, Mo–Si, and Ni–Si–Mo in the ferrite matrix.[8–10] These clusters are considered precursors of G–phase nucleation and precipitation. Cast stainless steels with low activation energy and slow embrittlement at 400°C show G–phase precipitation after aging, and steels with high activation energy and fast embrittlement at 400°C do not contain a G phase.[8–10,17,18] The presence of Ni–Si–Mo clusters in the ferrite matrix of an unaged material may be considered a signature of steels that are potentially sensitive to thermal embrittlement, i.e., steels with Ni–Si–Mo clusters in the ferrite matrix show low activation energy for thermal embrittlement but take longer to embrittle at 400°C.

The kinetics of thermal embrittlement of cast stainless steels are controlled primarily by the kinetics of ferrite strengthening, e.g., activation energy determined from ferrite hardness measurements shows very good agreement with that obtained from the Charpy–impact data.[13,14,22] Microstructural characterization and annealing studies on thermally aged cast stainless steel show that strengthening of ferrite is caused primarily by spinodal decomposition of ferrite to form the Cr–rich α' phase.[4,9,10] Consequently, the kinetics of thermal embrittlement should be controlled by the amplitude and frequency of Cr fluctuations produced by spinodal decomposition, i.e., by the size and spacing of the α' phase. The low activation energies of thermal embrittlement are most likely caused by variations in the spacing of Cr fluctuations; atom probe field–ion microscopy studies indicate that the spacing between Cr fluctuations decreases with decreasing temperature.[17,21] During thermal aging, production heat treatment and possibly the casting process, both of which affect ferrite composition and microstructure of unaged material, can influence microstructural evolution and, therefore, the kinetics of embrittlement.

For most materials, the kinetics of thermal embrittlement vary with aging temperature. For a specific heat of cast stainless steel, activation energy of thermal embrittlement is not constant over the temperature range of 290–450°C (554–842°F), but increases with decreasing temperature.[1–3,13] The increase is particularly significant between 400 and 450°C (752 and 842°F). In addition, materials aged at 450°C show precipitation of phase–boundary carbides (also nitrides in high–N steels) and a decrease in ferrite content of the steel.[1,2] At reactor temperatures, such processes either do not occur or their kinetics are extremely slow. Consequently, data obtained after 450°C aging do not reflect the mechanisms that are active under reactor operating conditions, and extrapolation of the 450°C data to predict the extent of thermal embrittlement at reactor temperatures is not valid. The activation energy for thermal embrittlement may be represented by an average value in the temperature range of 290–400°C (554–752°F).

3 Experimental Procedure

3.1 Material Procurement

Material was obtained from various experimental and commercial heats of CF–3, CF–8, and CF–8M (ASTM Specification A 351) cast stainless steels in differing product forms and section thicknesses. Six experimental heats of cast stainless steel were procured in the form of 76–mm–thick slabs. Materials from the commercial heats included sections of four different centrifugally cast pipes (CF–8 and CF–8M grades), a pump impeller (CF–3 grade), and a pump casing ring (CF–8 grade). The outer diameter and wall thickness of the cast pipes ranged from 0.6 to 0.9 m and 38.1 to 76.2 mm, respectively.

A cover plate assembly from the recirculating pump of the KRB reactor in Gundremmingen, Germany was also procured. The cover plate assembly was in service for approximately eight effective full power years (efpys) at a service temperature of 284°C (543°F). The plate assembly was decontaminated and samples were obtained from the inner 25–mm–thick region of the plate. The average temperature of the samples was estimated to be 280°C.

3.2 Material Characterization

The various cast materials were characterized to determine their chemical composition, hardness, grain structure, and ferrite content and distribution. All castings were examined in the three orientations as well as at different locations, namely, material near the center and near the inner and outer surfaces of the pipes, and top and bottom regions of the slabs. A ferrite scope (Auto Test FE, Probe Type FSP–1) was used to measure the ferrite content of the castings. The instrument was calibrated with several weld metal standards (ferrite numbers between 2.4 and 28.1) obtained from the British Welding Institute. The distribution of ferrite was determined by the intercept method, i.e., by counting the number of ferrite/austenite phase boundaries intersected by a superimposed outline. The chemical composition, hardness, and ferrite content and distribution of the cast materials are given in Table 1. For each material, the ferrite content calculated from the composition with Hull's equivalent factor[24] are also listed in the table.

Some differences in hardness and ferritic content were observed for material from various locations in the castings. The ferrite content was lower and the hardness slightly higher toward the top of the static–cast slabs or the inner surface of the centrifugally cast pipes. This behavior appears to be related to compositional variations, particularly changes in Ni content. In general, the hardness of the cast material increased with an increase in ferrite content. For the same ferrite content, the hardness of CF–8 and CF–8M material is comparable, whereas the hardness of CF–3 material is lower. An increase in N content increases the hardness of cast stainless steels of all grades.

The grain structures of the various castings were examined along the axial, circumferential, and radial sections. Descriptions of the structures observed in the four centrifugally cast pipe sections and the pump casing ring are given in Table 2. Two castings, Heats P1 and P2, contain equiaxed grains across the entire thickness of the pipe. Grain size and distribution in the various orientations do not differ significantly, as shown in Fig. 2. The equiaxed grains were probably produced intentionally by a low pouring temperature or by shear between the

Table 1. Product form, chemical composition, hardness, and ferrite morphology of various heats of cast stainless steel

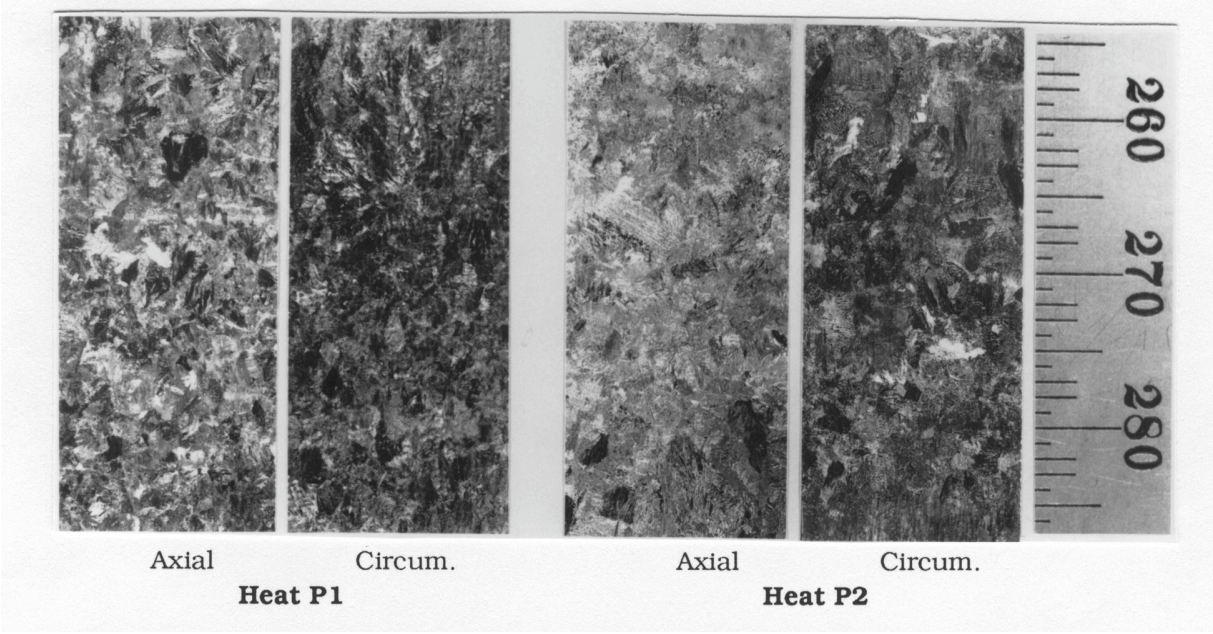
Heat	Grade	Chemical Composition (wt.%) Mn	Si	P	S	Mo	Cr	Ni	N	C	Ferrite[a] (%) Calc.	Meas.	Hardness R_B	Ferrite Spacing (μm)
76-mm Slabs[b]														
69	CF–3	0.63	1.13	0.015	0.005	0.34	20.18	8.59	0.028	0.023	21.0	23.6	83.7	35
73	CF–8	0.72	1.09	0.028	0.016	0.25	19.43	8.54	0.053	0.070	7.0	7.7	78.8	253
68	CF–8	0.64	1.07	0.021	0.014	0.31	20.64	8.08	0.062	0.063	14.9	23.4	84.6	87
70	CF–8M	0.55	0.72	0.021	0.016	2.30	19.17	9.01	0.049	0.066	14.2	18.9	86.5	96
74	CF–8M	0.54	0.73	0.022	0.016	2.51	19.11	9.03	0.048	0.064	15.5	18.4	85.8	90
75	CF–8M	0.53	0.67	0.022	0.012	2.58	20.86	9.12	0.052	0.065	24.8	27.8	89.5	69
Reactor Components[c]														
P3	CF–3	1.06	0.88	0.017	0.014	0.01	18.89	8.45	0.168	0.021	2.8	1.9	82.2	–
P2	CF–3	0.74	0.94	0.019	0.006	0.16	20.20	9.38	0.040	0.019	12.5	15.6	83.8	69
I	CF–3	0.47	0.83	0.030	0.011	0.45	20.20	8.70	0.032	0.019	20.4	17.1	81.0	65
C1	CF–8	1.22	1.18	0.033	0.008	0.65	19.00	9.37	0.040	0.039	7.8	2.2	79.5	–
P1	CF–8	0.59	1.12	0.026	0.013	0.04	20.49	8.10	0.056	0.036	17.7	24.1	84.9	90
205	CF–8M	0.93	0.63	0.019	–	3.37	17.88	8.80	–	0.040	21.0	15.9	–	79
758	CF–8M	0.91	0.62	0.018	–	3.36	17.91	8.70	–	0.030	24.2	19.2	–	62
Reactor–Aged[d]														
KRB	CF–8	0.31	1.17	–	–	0.17	21.99	8.03	0.038	0.062	27.7	34.0	–	–

[a] Calculated from the composition with Hull's equivalent factor. Measured by ferrite scope AUTO Test FE, Probe Type FSP–1.
[b] *Static Cast Slabs*: Foundry ESCO; Size 610 x 610 x 76 mm.
[c] *Centrifugally Cast Pipes*:
P3 Foundry SANDUSKY; Size 580 mm O.D.,76 mm wall.
P2 Foundry FAM, France; Size 930 mm O.D., 73 mm wall.
P1 Foundry ESCO; Size 890 mm O.D., 63 mm wall.
205 Size 305 mm O.D., 25 mm wall.
Static Cast:
Elbow 758: Size 305 mm O.D., 30 mm wall.
Pump Impeller I: Foundry ESCO; Size 660 mm diameter.
Pump Casing C1: Foundry ESCO; Size 600 mm O.D., 57 mm wall.
[d] *KRB Reactor Pump Cover Plate*: Foundry GF; Size 890 mm diameter.

Table 2. Ferrite content and grain structure of various cast stainless steel pipes

Heat	o.d. (m)	Wall (mm)	Process	Grade	Ferrite Content (%)[a] o.d.	i.d.	Grain Structure
C1	0.60	57.1	Static	CF–8	2.3	1.7	Banded, columnar/equiaxed radial to axial growth near ends
P1	0.89	63.5	Centr.	CF–8	27.6	19.5	Equiaxed across thickness
P3	0.58	51.6	Centr.	CF–3	2.5	0.9	Banded, radially oriented columnar one equiaxed band (≈4 mm deep) near i.d.
P2	0.93	73.0	Centr.	CF–3	15.9	13.2	Equiaxed across thickness

[a] Ferrite content measured by Ferrite Scope, Auto Test FE, Probe Type FSP–1.



Axial Circum. Axial Circum.

Heat P1 **Heat P2**

Figure 2. Grain structure along the axial and circumferential sections of centrifugally cast pipes P1 and P2

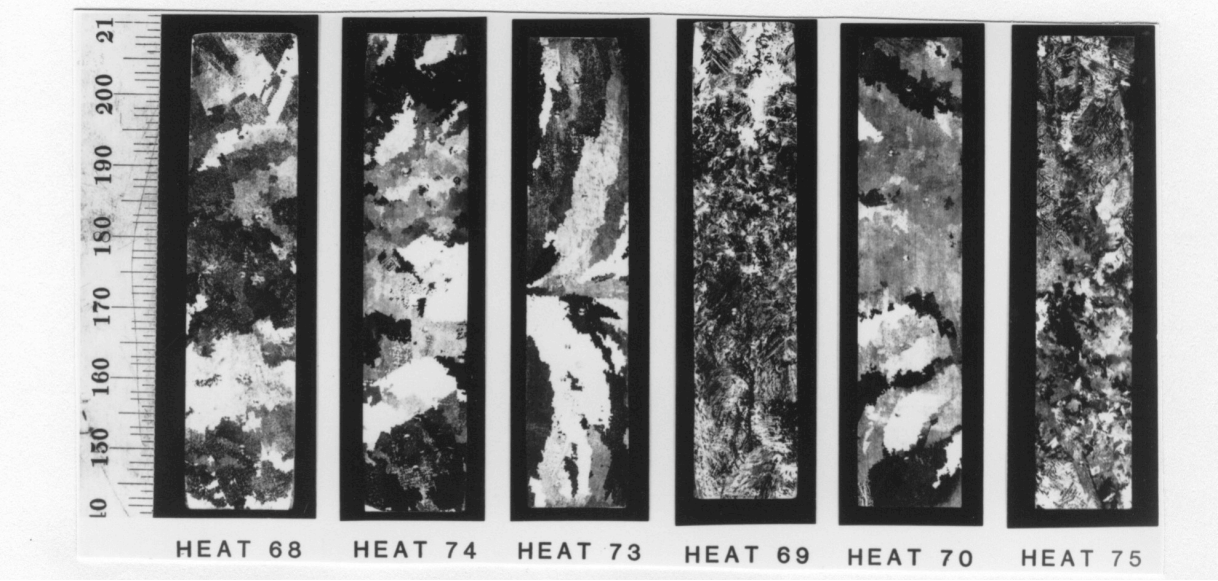


Figure 3. Grain structure of various static–cast slabs

liquid and solid; the shear could cause dendrite arms to break and disperse in the liquid–solid region.

The static–cast slabs and the pump casing ring showed a mixed structure of columnar and equiaxed grains. The grain structures of the cast slabs are shown in Fig. 3. A change from horizontal to vertical growth of the columnar grains was observed near the edges of the cast slabs, e.g., Heat 73. The size of the equiaxed grains in the mixed structure is generally smaller than that of the columnar grains.

The ferrite morphology of the various materials varied with ferrite content, chemical composition, and size of the casting. The ferrite morphology was globular for materials containing <5% ferrite. Some differences in morphology were observed between the different grades of cast stainless steel containing >5% ferrite. The CF–8 and CF–8M steels exhibited a lacy morphology, i.e., an interlaced network of ferrite islands, whereas the CF–3 cast steel showed a mixture of lacy and acicular ferrite. The acicular morphology is characterized by fine needle–like ferrite that is distributed in the austenite matrix. All morphologies were randomly arranged within the casting. Typical microstructures for the static–cast slabs and pump impeller and centrifugally cast pipes are shown in Figs. 4 and 5.

3.3 Tensile Tests

Tensile tests were conducted at ANL and at Materials Engineering Associates (MEA). The orientation and location of the mechanical–test specimens from pipe sections, slabs, and the KRB pump cover plate are shown in Figs. 6 and 7. The specimen blanks from the experimental and commercial heats were aged at 290, 320, 350, 400, and 450°C (554, 608, 662, 752, and 842°F) for times up to 58,000 h. Details of the test procedure and results for the tests at MEA have been presented earlier.[25,26]

Tests at ANL were performed according to ASTM Specification E 8 and E 21 in an Instron tensile test machine with a maximum loading capacity of 90 kN (20 kips). Cylindrical specimens with a diameter of 5.0 mm (0.2 in.) and a gauge length of 20.3 mm (0.8 in.) were used for all the tests, Fig. 8. An axial extensometer, with an initial gauge length of 20.3 mm (0.8 in.), was used for continuous measurement of strain during room–temperature tests. An IBM computer was used to digitize load, crosshead movement, and axial displacement data, and to store the data on floppy disks. Analog traces of load–vs.–crosshead displacement and load–vs.–extensometer displacement were also obtained for each test.

The true stress–strain data were calculated up to the maximum load using the constant–volume criterion, which assumes a homogeneous distribution of strain along the gauge length. However, most specimens showed inhomogeneous deformation because of relatively large grain structure. The specimen surfaces along the gauge length were irregular, and the fracture cross sections were often elliptical. These factors created some uncertainty in the true stress–strain data. True fracture stress was obtained from the fracture load and cross–sectional area at fracture. The strain at fracture, i.e., total elongation, was determined from extensometer displacements. Total elongation was also measured from crosshead displacements; the values obtained from the extensometer were ≈64% of the values determined from crosshead displacement. Correlations between crosshead displacement and total strain in the specimen gauge length were also developed from the room–temperature tests. These correlations were used to correct the data for the elevated–temperature tests.

The tests at 290°C (≈550°F) were conducted in a forced–air recirculating furnace. Thermocouples were mounted above and below the specimen gauge length to monitor and control the temperature within ±2°C. For the tests on samples aged for <10,000 h, an axial extensometer was not used for the elevated–temperature tests. Total strain in the specimen gauge length was determined from correlations developed from the room–temperature tests. The total elongation was determined from the crosshead displacement multiplied by 0.64.

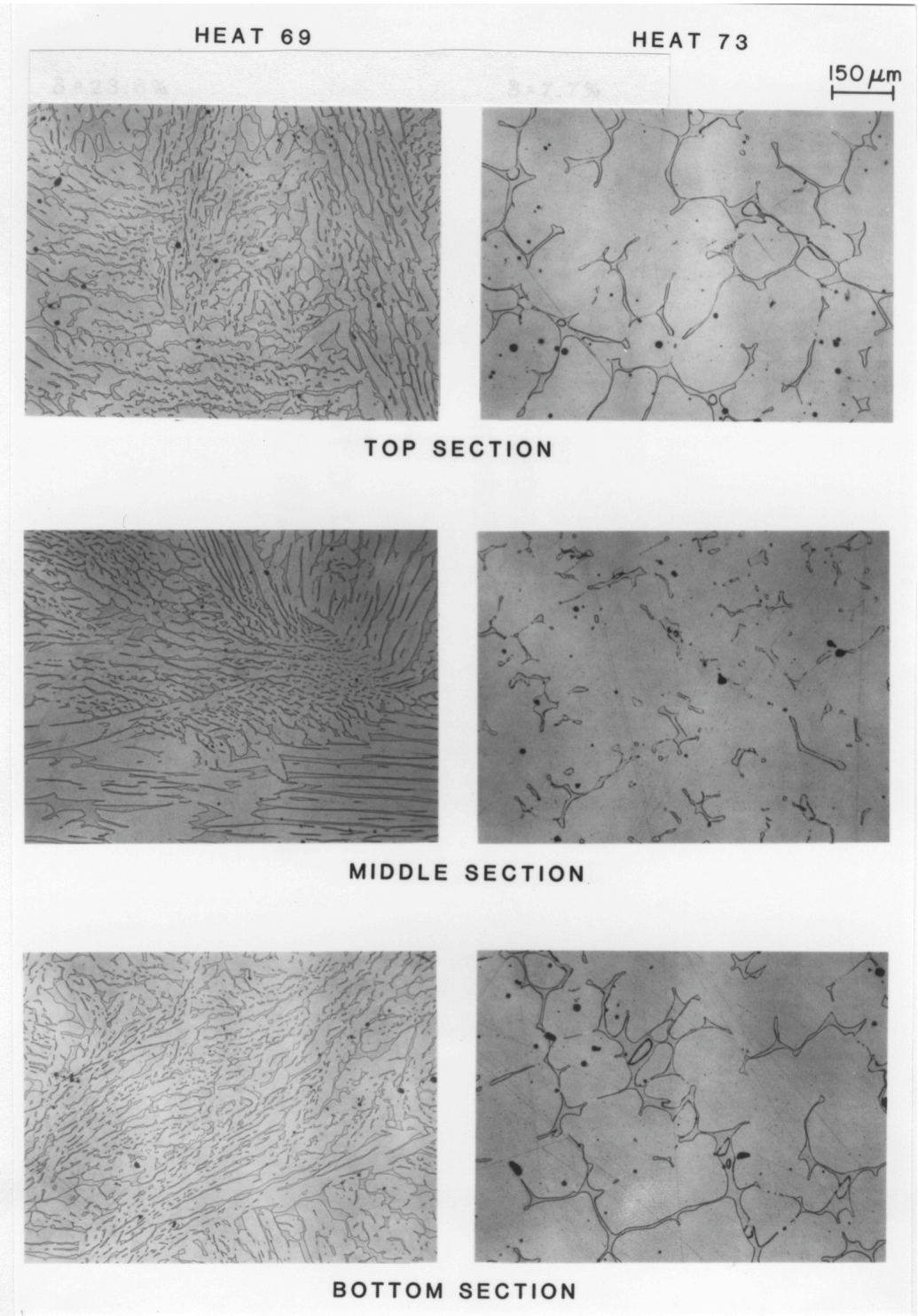


Figure 4. Ferrite morphology from three locations across the thickness of static–cast slabs of CF–3 (Heat 69), CF–8 (Heats 73 and 68), and CF–8M (Heats 74, 70, and 75)

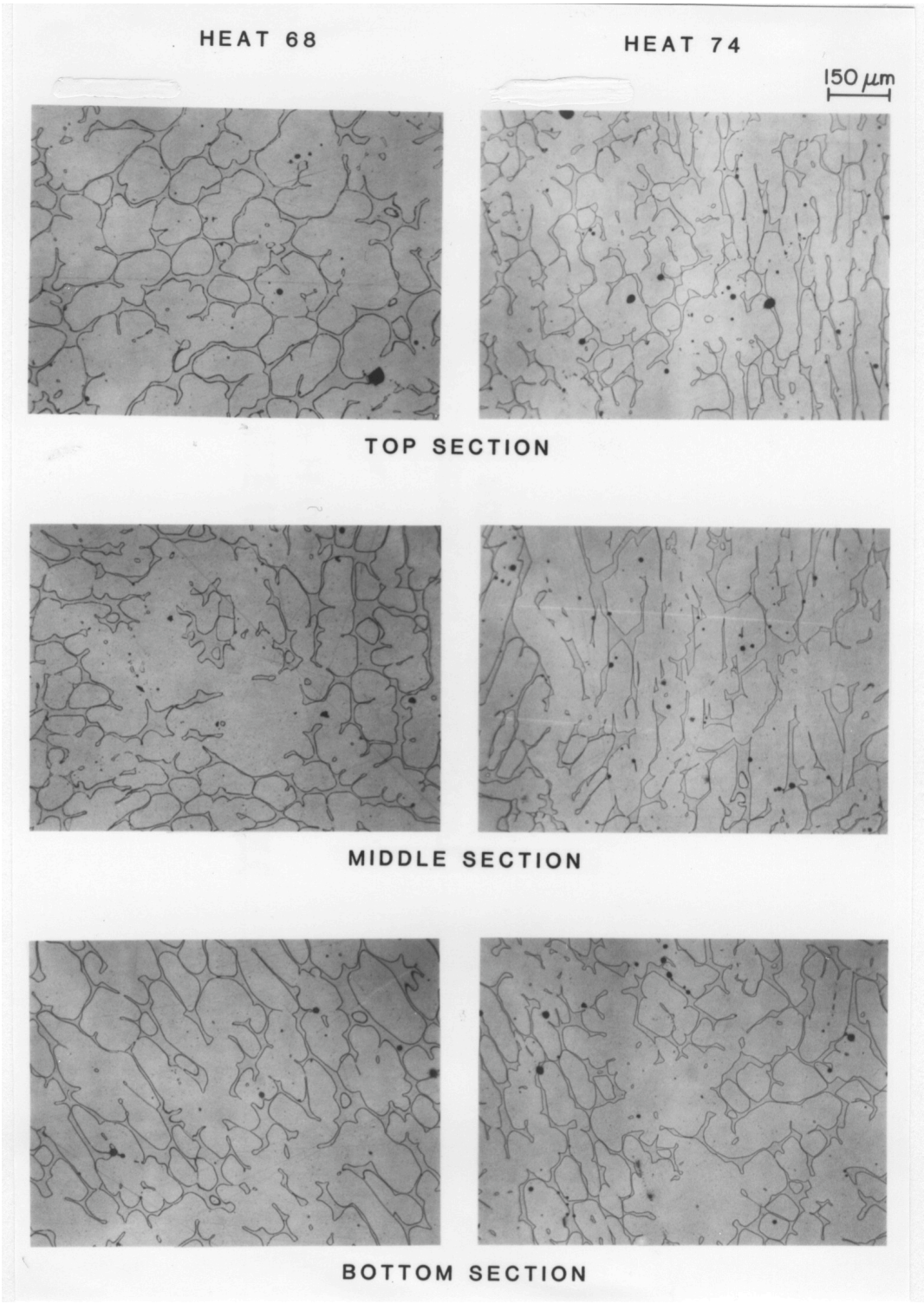
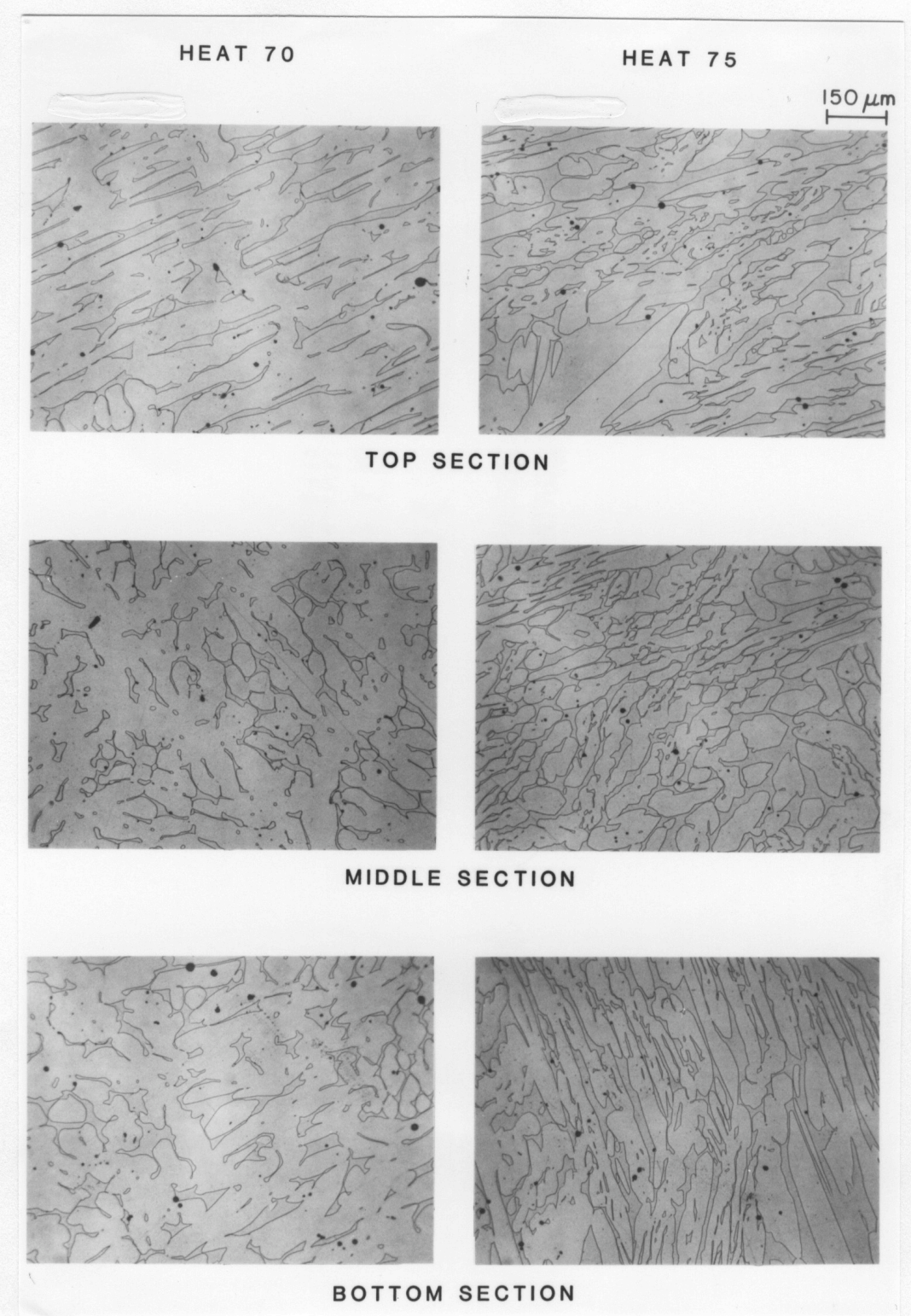


Figure 4. (Contd.)



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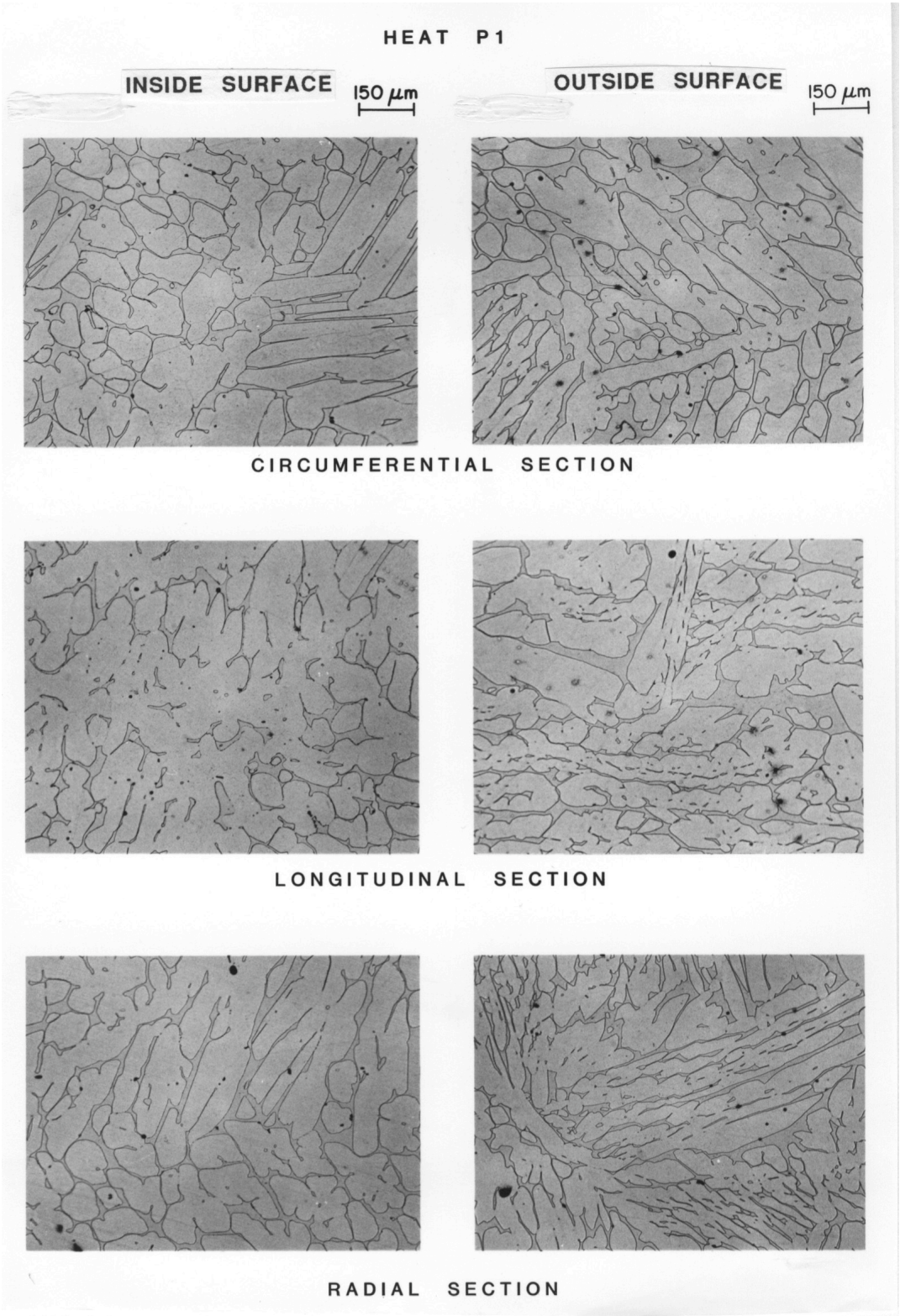


Figure 5. Ferrite morphology along the three orientations of the centrifugally cast pipes (Heats P1, P2, and P3) and the static–cast pump impeller (Heat I)

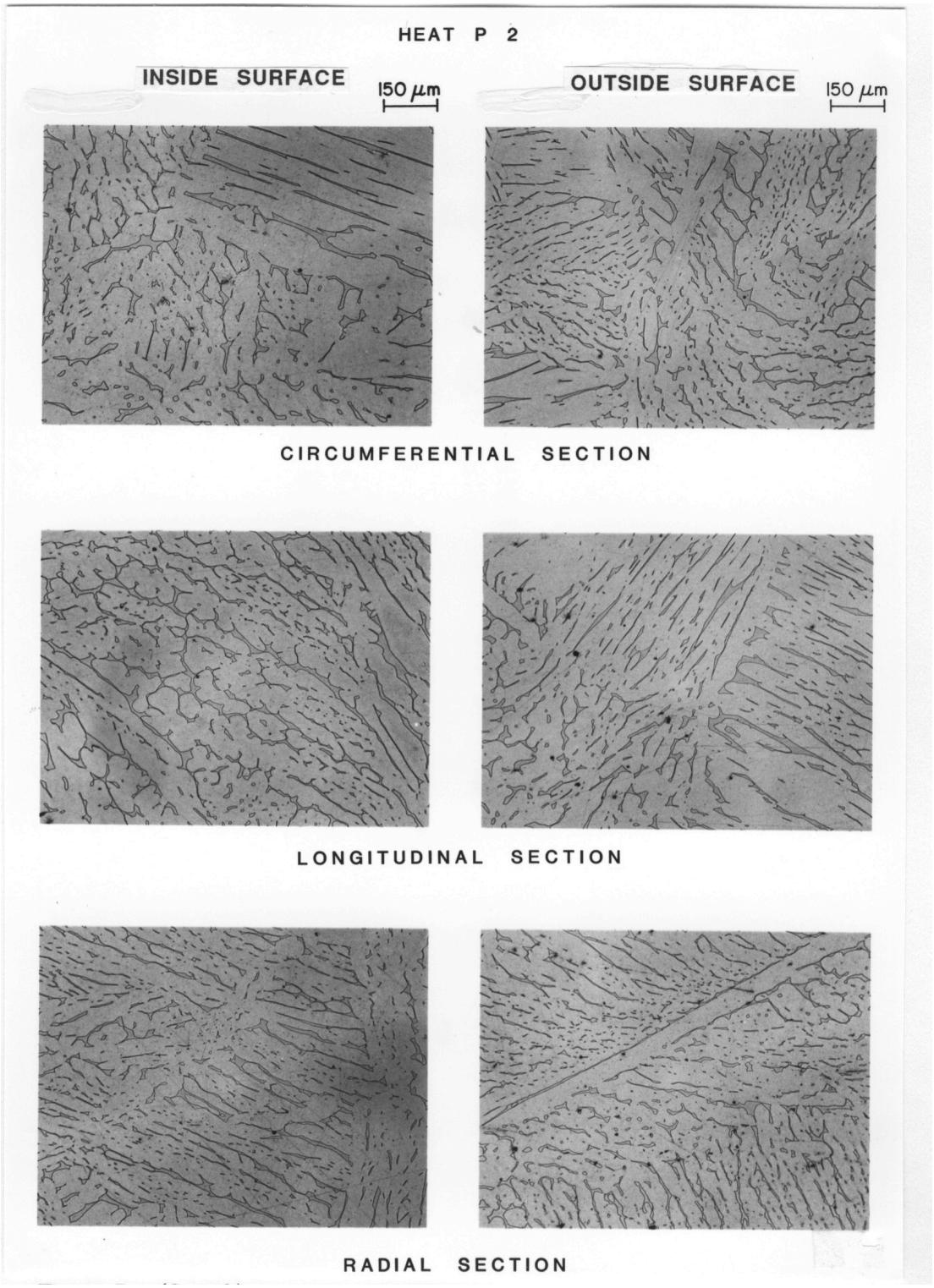


Figure 5. (Contd.)

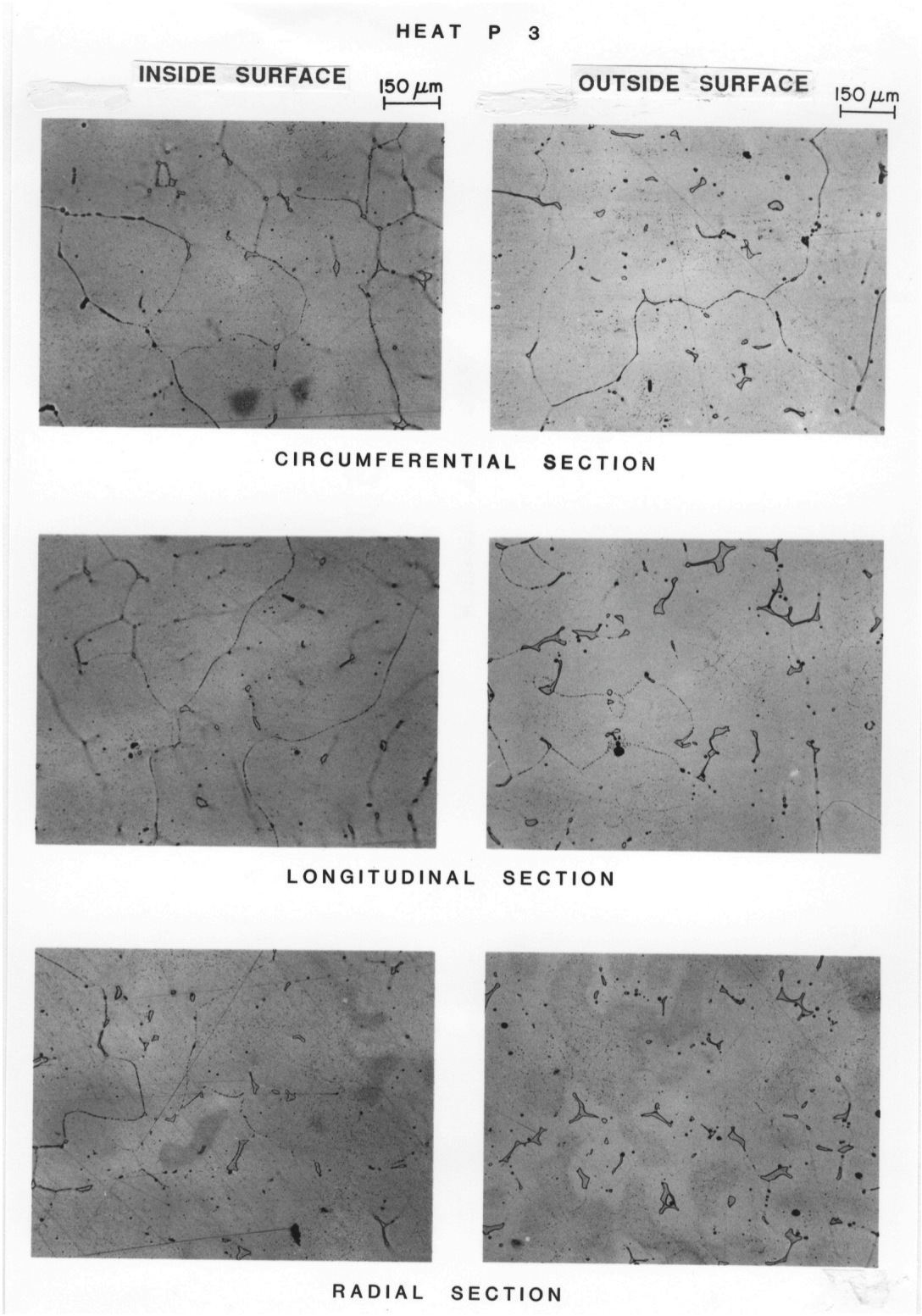


Figure 5. (Contd.)

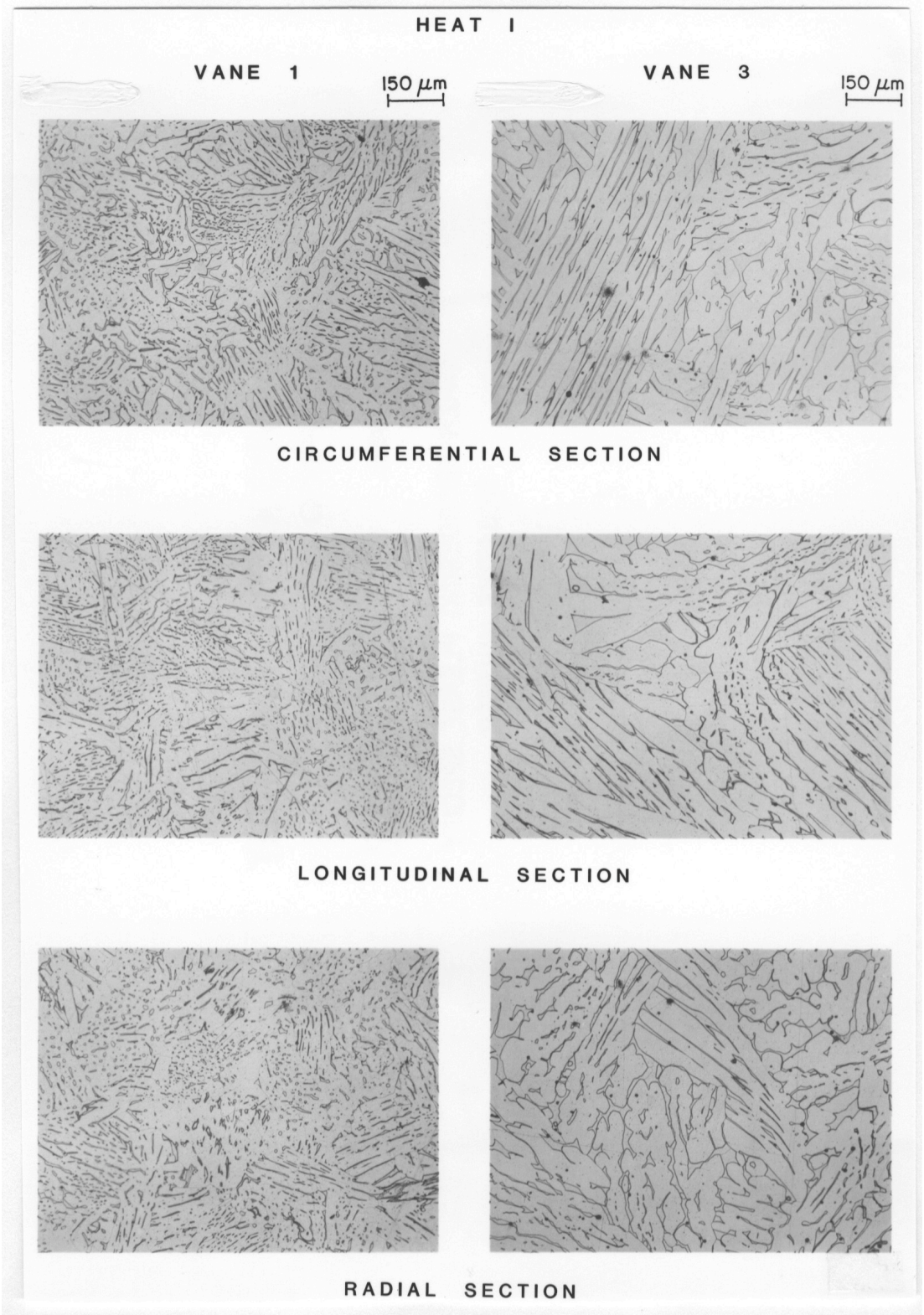


Figure 5. (Contd.)

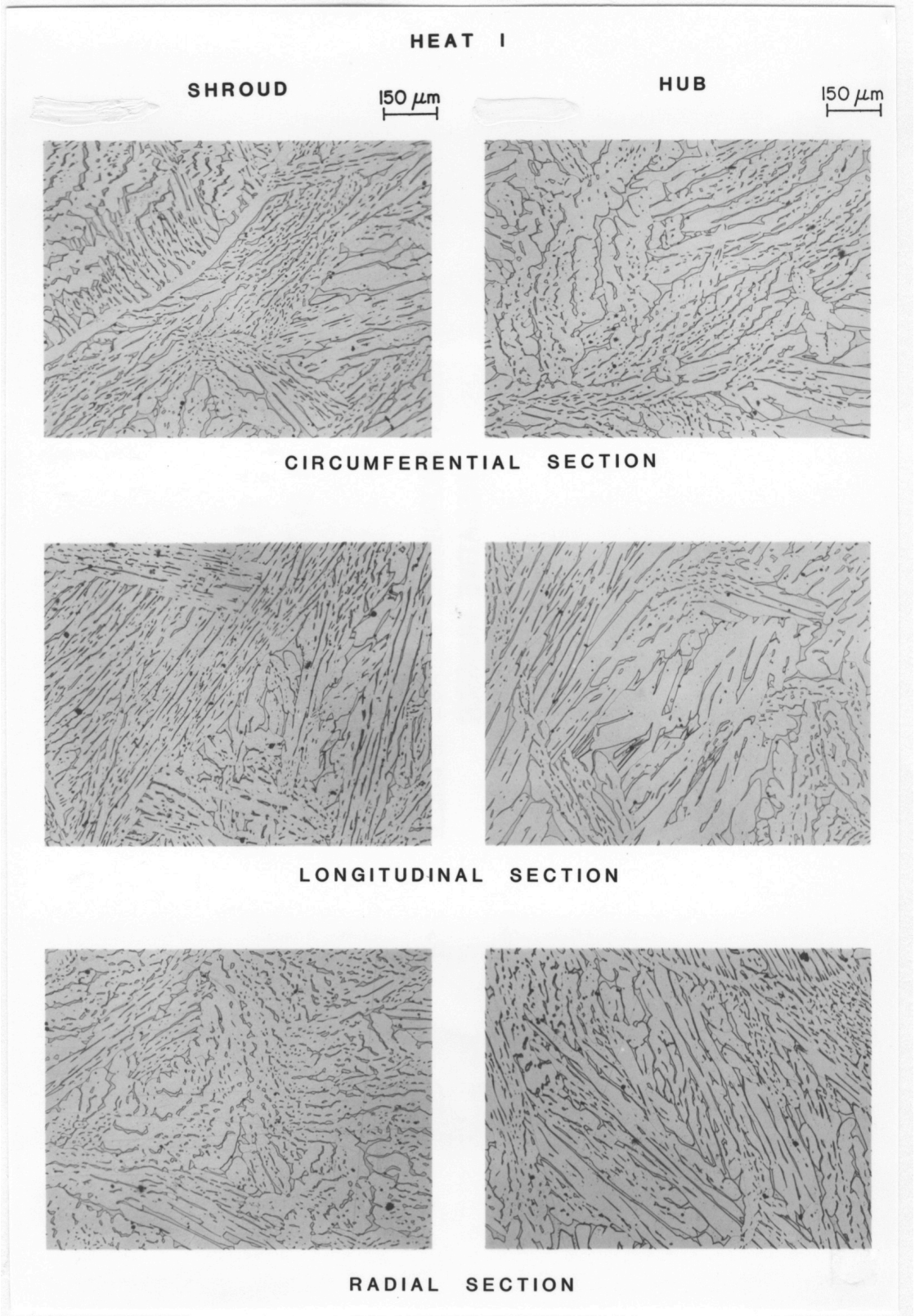


Figure 5. (Contd.)

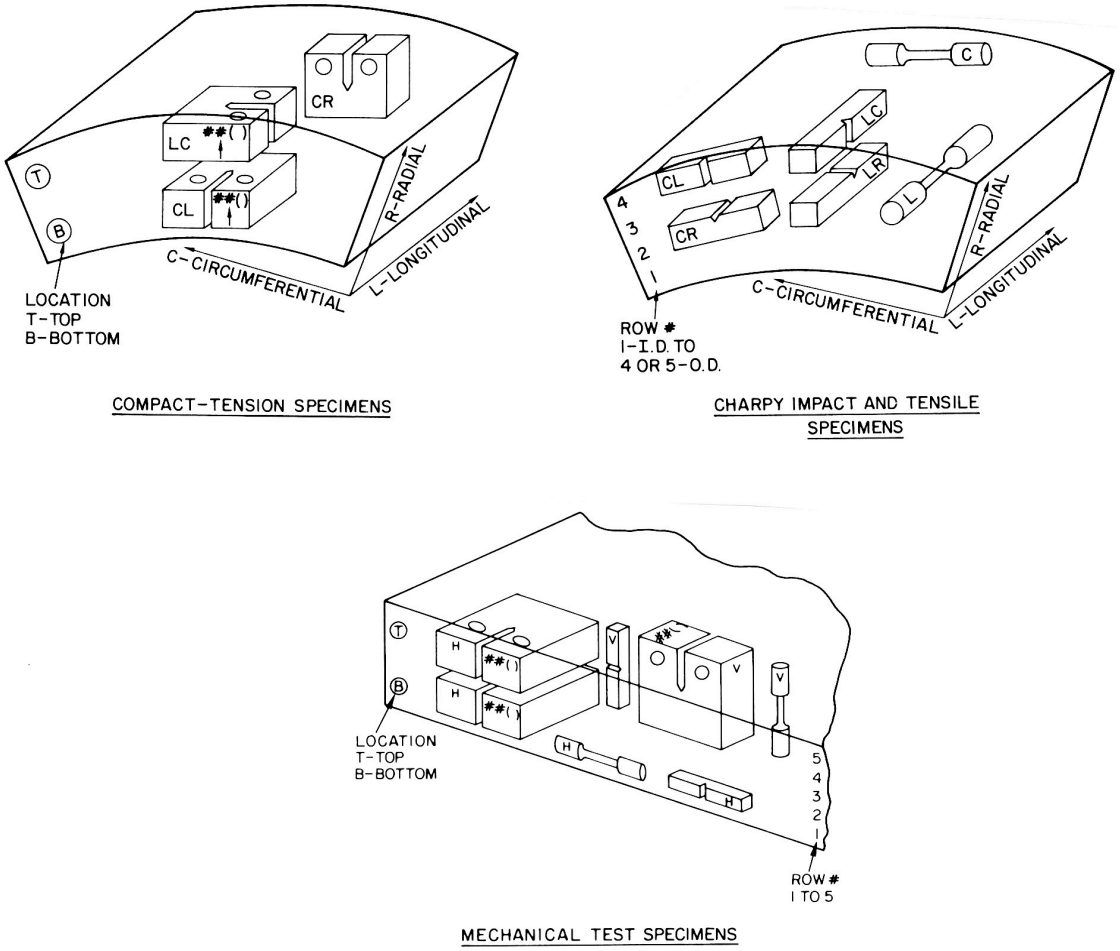


Figure 6. Orientation and location of the mechanical–test specimens taken from (a) and (b) pipe sections and (c) slabs

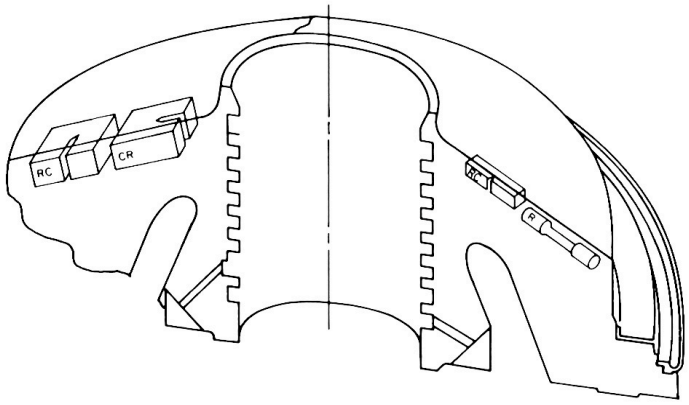
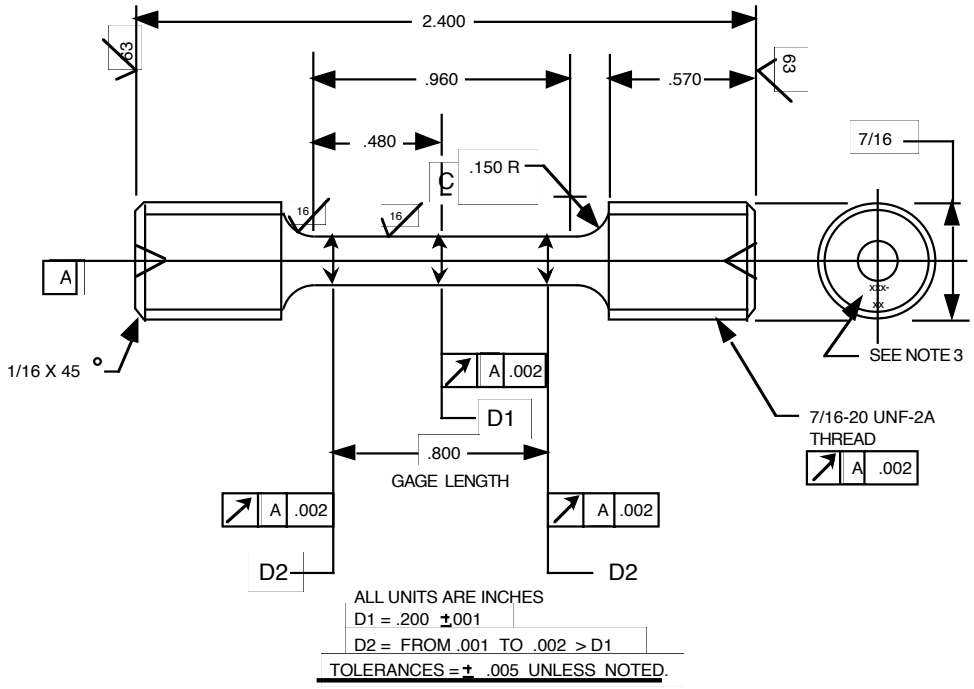


Figure 7. Orientation and location of the mechanical–test specimens taken from KRB pump cover plate



1. THE .800 INCH GAGE LENGTH TO HAVE UNIFORM SLOPE FROM MAX. DIA. D2 TO MIN. DIA. D1. UNIFORM SLOPE MUST NOT EXCEED .004 CHANGE IN DIA. PER 1 INCH CHANGE IN LENGTH.
2. ALL RADII MUST BLEND WITHOUT UNDERCUTS OR STEPS.
3. DIMENSIONS AND SPECIFICATIONS TYPICAL BOTH ENDS.
4. ALL SURFACES TO BE FREE OF BURRS.

Figure 8. Configuration of tensile test specimen

Elevated–temperature tests on the long–term–aged samples were conducted with a clip gauge mounted on the specimen grips. Total strain in the specimen gauge length was determined from correlations developed from room–temperature tests conducted with clip gauge attached to the specimen grips and the extensometer mounted on the specimen gauge length.

The results for ten commercial and experimental heats aged up to 58,000 h at temperatures between 290 and 450°C are given in Table 3; results from the tests at MEA are also included in the table.

4 Effect of Thermal Aging

4.1 Tensile Strength

Tensile tests were conducted at room temperature and 290°C (554°F) on three commercial and five experimental heats aged up to 58,000 h at 290–450°C (554–842°F) and on service–aged material from the KRB pump cover plate. The results from the tests, which were conducted at ANL[27] and MEA,[25,26] are given in the Appendix. The engineering stress–vs.–strain curves for six of the heats of CF–3, CF–8, and CF–8M steel aged up to 50,000 h at 320, 350, and 400°C and tested at room temperature and 290°C are shown in Figs. 9–14. At both test

Table 3. Tensile test results for cast stainless steels

Specimen Number	Orien–tation[a]	Heat[b]	Test Temp. (°C)	Engineering 0.2% Yield Stress (MPa)	Engineering Ultimate Stress (MPa)	Fracture Stress (MPa)	Elong–ation (%)	Red. in Area (%)	Aging Condition Temp. (°C)	Aging Condition Time (h)	Ref.[b]
				CF–3 Grade							
I1V–01	L	I	25	264.8	598.8	1636.6	84.6	79.3	Unaged	–	2
I1V–02	L	I	25	242.1	583.4	1698.5	78.4	79.5	Unaged	–	2
I2V–01	L	I	25	251.0	579.9	1274.6	77.4	74.3	Unaged	–	2
I2V–02	L	I	25	257.7	578.1	1671.8	75.0	80.2	Unaged	–	2
I3C–01	L	I	25	239.7	517.6	1274.8	66.2	69.5	Unaged	–	2
I2V–23	L	I	25	235.8	637.3	1387.7	72.5	66.7	320	30000	1
I3C–14	L	I	25	278.2	633.9	1411.7	56.9	68.2	320	30000	1
I3V–38	L	I	25	255.0	609.6	1432.6	56.6	68.5	320	30000	1
I3V–39	L	I	25	282.5	452.7	858.8	12.7	50.5	320	30000	1
I1V–26	L	I	25	281.3	615.4	1897.6	60.6	77.4	350	10000	2
I1V–27	L	I	25	303.4	644.7	1445.0	–	62.2	350	10000	2
I2V–19	L	I	25	314.7	642.0	1296.9	72.0	68.4	350	10000	2
I2V–03	L	I	290	169.2	409.2	756.1	–	58.9	Unaged	–	2
I2V–06	L	I	290	178.5	402.4	837.8	39.4	64.6	Unaged	–	2
I3C–02	L	I	290	158.6	387.3	819.5	33.0	66.2	Unaged	–	2
I2V–24	L	I	290	178.6	445.9	710.7	28.9	57.2	320	30000	1
I3C–15	L	I	290	163.6	427.2	810.4	27.9	67.2	320	30000	1
I3V–40	L	I	290	–	470.5	828.9	18.5	54.7	320	30000	1
I1V–28	L	I	290	192.4	381.1	503.0	–	36.0	350	10000	2
I1V–29	L	I	290	189.0	442.8	780.5	34.2	59.7	350	10000	2
I2V–20	L	I	290	179.1	437.8	756.0	39.0	51.6	350	10000	2
P21T–01	C	P2	25	216.3	538.3	1000.4	72.6	59.9	Unaged	–	2
P23T–01	C	P2	25	238.1	556.8	1568.6	106.0	84.4	Unaged	–	2
P22A–01	L	P2	25	206.4	561.7	1094.5	73.7	75.7	Unaged	–	2
P23A–01	L	P2	25	216.7	536.9	887.4	62.4	75.1	Unaged	–	2
P22T–16	C	P2	25	247.0	580.1	1547.8	65.4	79.9	290	30000	1
P21A–31	L	P2	25	242.6	571.1	2017.1	65.9	84.7	290	30000	1
P25A–28	L	P2	25	223.9	548.3	1797.3	57.2	87.0	290	30000	1
P21A–36	L	P2	25	263.6	583.8	1564.4	58.3	79.3	290	58000	1
P24T–14	C	P2	25	229.4	600.0	1944.4	73.1	82.3	320	30000	1
P25T–10	C	P2	25	258.1	581.8	1535.3	55.4	75.5	320	30000	1
P22A–36	L	P2	25	237.4	603.0	1487.0	77.8	80.5	320	30000	1
P21A–19	L	P2	25	249.7	605.2	1673.6	49.4	78.3	320	55000	1
P22T–04	C	P2	25	252.3	601.8	2162.5	–	85.3	350	10000	2
P23A–14	L	P2	25	249.2	594.3	2783.2	73.6	88.5	350	10000	2
P23A–26	L	P2	25	265.2	608.5	1830.3	76.6	78.8	350	10000	2
P22T–11	C	P2	25	249.3	628.4	1235.0	68.6	64.4	350	30000	1
P22A–13	L	P2	25	245.5	615.4	1598.5	65.5	76.2	350	30000	1
P24A–32	L	P2	25	225.4	617.2	1799.8	68.9	79.0	350	30000	1
P24T–05	C	P2	25	233.5	603.1	1268.2	–	68.8	400	10000	2
P24A–04	L	P2	25	236.2	616.8	2384.5	–	78.0	400	10000	2
P21T–02	C	P2	290	161.3	387.1	819.1	44.6	72.2	Unaged	–	2
P23T–02	C	P2	290	154.2	405.0	688.2	42.4	65.9	Unaged	–	2
P22A–02	L	P2	290	137.9	406.9	755.7	47.2	65.9	Unaged	–	2
P23A–02	L	P2	290	144.0	385.1	538.7	39.9	59.6	Unaged	–	2
P21A–32	L	P2	290	162.3	403.4	830.6	36.8	74.5	290	30000	1
P21A–33	L	P2	290	155.2	405.9	740.8	35.0	73.7	290	30000	1
P24T–16	C	P2	290	148.2	407.0	389.5	39.9	78.7	290	30000	1
P21A–37	L	P2	290	164.2	410.7	1152.1	33.1	72.2	290	58000	1
P22T–17	C	P2	290	177.5	422.7	1094.7	37.9	72.3	290	58000	1
P21A–14	L	P2	290	153.2	428.9	968.4	31.4	73.0	320	30000	1
P21A–15	L	P2	290	163.9	422.7	815.5	30.9	62.9	320	30000	1
P21A–16	L	P2	290	152.6	407.7	870.6	28.8	71.9	320	30000	1
P25T–12	C	P2	290	171.4	418.4	790.5	31.5	62.5	320	55000	1
P21A–18	L	P2	290	168.6	416.4	980.1	31.2	67.9	320	55000	1

Table 3. (Contd.)

Specimen Number	Orien–tation[a]	Heat	Test Temp. (°C)	Engineering 0.2% Yield Stress (MPa)	Engineering Ultimate Stress (MPa)	Fracture Stress (MPa)	Elong–ation (%)	Red. in Area (%)	Aging Condition Temp. (°C)	Aging Condition Time (h)	Ref.[b]
P21T–08	C	P2	290	155.6	423.5	876.3	49.8	70.7	350	10000	2
P22T–05	C	P2	290	153.8	399.0	696.5	43.0	66.9	350	10000	2
P23A–15	L	P2	290	161.0	415.4	900.5	–	69.7	350	10000	2
P23A–27	L	P2	290	154.1	419.4	970.7	39.6	72.9	350	10000	2
P22T–12	C	P2	290	167.0	436.2	740.2	28.2	56.0	350	30000	1
P24A–30	L	P2	290	142.4	432.1	828.0	38.5	60.9	350	30000	1
P24A–33	L	P2	290	149.1	425.7	463.7	41.5	62.6	350	30000	1
P24T–06	C	P2	290	160.4	447.1	818.5	40.2	56.4	400	10000	2
P24A–05	L	P2	290	146.6	430.6	655.0	40.2	53.8	400	10000	2
693–40	H	69	25	278.8	606.0	1070.1	57.1	48.9	Unaged	–	2
693–41	H	69	25	273.4	583.6	1093.4	54.1	54.4	Unaged	–	2
694–30	H	69	25	253.6	592.7	1430.6	50.1	71.8	290	30000	1
694–31	H	69	25	264.1	588.9	1714.0	51.1	76.4	290	30000	1
69–135	V	69	25	244.7	600.6	1617.5	62.8	74.5	290	30000	1
694–21	H	69	25	286.7	624.6	1757.0	52.2	76.1	320	10000	1
694–25	H	69	25	232.1	585.4	1428.3	70.5	75.2	320	10000	1
692–40	H	69	25	289.6	622.0	1516.1	43.6	72.3	320	30000	1
692–41	H	69	25	269.4	604.4	1623.8	38.0	75.2	320	30000	1
69–245	V	69	25	272.5	485.8	–	12.9	25.4	320	30000	1
691–28	H	69	25	291.6	637.9	1484.8	45.7	69.2	320	50000	1
691–29	H	69	25	287.7	650.5	1604.0	50.3	71.7	320	50000	1
69–230	V	69	25	298.8	669.4	1713.1	53.5	71.8	320	50000	1
692–25	H	69	25	285.4	633.4	1483.2	67.7	76.2	350	2570	2
692–26	H	69	25	302.6	648.2	1364.3	62.5	72.4	350	2570	2
694–06	H	69	25	292.1	652.0	1902.3	54.2	76.0	350	10000	1
694–07	H	69	25	266.2	635.5	1480.4	53.5	71.6	350	10000	1
694–08	H	69	25	246.8	619.9	1564.4	54.7	72.7	350	10000	1
69–119	V	69	25	249.6	617.3	1811.6	51.6	78.4	350	10000	1
693–12	H	69	25	270.9	674.0	1795.8	50.6	71.4	350	30000	1
693–13	H	69	25	259.2	655.1	1665.4	49.0	68.9	350	30000	1
69–130	V	69	25	258.4	661.2	1936.1	55.3	74.8	350	30000	1
692–16	H	69	25	253.6	638.8	1358.9	52.4	72.4	400	2570	2
692–17	H	69	25	300.9	683.2	1309.9	44.3	60.6	400	2570	2
692–15	H	69	25	287.8	673.9	1409.6	43.6	56.8	400	10000	1
692–22	H	69	25	278.6	699.1	1727.1	51.2	68.3	400	10000	1
692–23	H	69	25	260.5	664.7	1653.4	53.3	72.0	400	10000	1
69–109	V	69	25	276.7	688.0	1796.6	65.7	73.5	400	10000	1
691–04	H	69	25	271.3	691.9	1476.9	36.5	71.4	450	2570	2
691–05	H	69	25	263.1	664.6	1528.2	56.6	73.2	450	2570	2
693–42	H	69	290	190.8	420.9	908.2	35.9	63.4	Unaged	–	2
694–40	H	69	290	177.0	417.0	809.0	33.6	59.7	Unaged	–	2
694–32	H	69	290	176.8	401.9	422.9	29.4	67.0	290	30000	1
694–33	H	69	290	173.0	386.7	543.7	21.5	51.3	290	30000	1
69–236	V	69	290	194.1	440.5	818.0	30.8	61.9	290	30000	1
694–26	H	69	290	174.4	408.7	697.5	21.8	60.5	320	10000	1
694–27	H	69	290	183.5	422.8	973.7	20.9	65.3	320	10000	1
692–42	H	69	290	178.5	423.2	709.8	21.6	55.0	320	30000	1
694–39	H	69	290	168.2	413.8	692.4	21.3	51.7	320	30000	1
69–246	V	69	290	165.5	423.0	921.8	27.8	70.6	320	30000	1
692–28	H	69	290	209.1	462.5	895.8	28.1	59.8	320	55000	1
692–29	H	69	290	212.3	464.4	911.6	27.9	58.5	320	55000	1
69–130	V	69	290	204.7	468.0	733.1	29.1	52.8	320	55000	1
692–27	H	69	290	173.1	451.3	752.6	32.3	53.8	350	2570	2
694–09	H	69	290	156.4	413.1	720.9	29.8	52.7	350	10000	1
69–120	V	69	290	179.8	429.8	875.1	23.2	68.8	350	10000	1

Table 3. (Contd.)

Specimen Number	Orien–tation[a]	Heat	Test Temp. (°C)	Engineering 0.2% Yield Stress (MPa)	Engineering Ultimate Stress (MPa)	Fracture Stress (MPa)	Elong–ation (%)	Red. in Area (%)	Aging Condition Temp. (°C)	Aging Condition Time (h)	Ref.[b]
693–14	H	69	290	186.4	457.6	832.1	28.0	58.0	350	30000	1
693–15	H	69	290	195.8	444.0	639.2	32.5	46.9	350	30000	1
69–270	V	69	290	193.6	462.4	739.4	27.7	49.4	350	30000	1
692–18	H	69	290	163.9	444.8	556.4	21.8	33.2	400	2570	2
692–24	H	69	290	173.3	494.5	785.1	23.4	44.8	400	10000	1
69–110	V	69	290	196.9	481.6	802.3	26.1	51.5	400	10000	1
691–06	H	69	290	177.7	479.7	683.6	28.5	44.9	450	2570	2
692–09	H	69	290	175.7	477.1	793.4	27.4	51.0	450	2570	2
					CF–8 Grade						
18–11	C	KRB	25	306.2	554.9	1348.9	56.8	67.0	280	68000	1
18–12	C	KRB	25	288.5	555.9	1426.1	35.0	70.2	280	68000	1
18–22	C	KRB	25	291.9	568.9	1162.3	40.4	59.2	280	68000	1
13–12	C	KRB	25	317.3	567.4	1285.7	57.4	67.7	Reannealed	–	1
13–21	C	KRB	25	289.2	575.2	1209.1	43.4	67.0	Reannealed	–	1
13–22	C	KRB	25	287.7	531.2	1370.6	44.0	69.5	Reannealed	–	1
15–11	C	KRB	290	214.0	469.0	924.1	33.4	62.4	280	68000	1
15–12	C	KRB	290	208.4	444.5	774.1	28.9	51.1	280	68000	1
15–21	C	KRB	290	199.6	482.5	842.1	38.3	53.3	280	68000	1
15–22	C	KRB	290	180.2	434.0	710.1	35.7	51.1	280	68000	1
16–21	C	KRB	290	184.0	405.0	605.4	25.9	41.5	Reannealed	–	1
17–21	C	KRB	290	171.5	416.2	875.3	42.1	66.3	Reannealed	–	1
P13T–01	C	P1	25	244.7	584.5	1221.5	56.5	68.8	Unaged	–	2
P13T–03	C	P1	25	245.9	579.9	1206.6	54.6	65.9	Unaged	–	2
P11A–01	L	P1	25	–	584.9	1127.0	57.7	64.0	Unaged	–	2
P13A–01	L	P1	25	248.5	584.5	1579.5	62.4	72.9	Unaged	–	2
P14T–09	C	P1	25	266.2	596.2	1561.8	74.6	74.4	290	30000	1
P11A–25	L	P1	25	285.7	595.2	1660.1	70.2	71.7	290	30000	1
P14A–26	L	P1	25	276.5	575.7	993.2	42.7	61.6	290	30000	1
P11A–28	L	P1	25	263.5	536.0	1915.5	68.1	78.3	290	58000	1
P11A–29	L	P1	25	266.1	562.0	415.05	63.5	51.9	290	58000	1
P11A–10	L	P1	25	279.1	622.6	1625.9	62.5	70.7	320	30000	1
P11T–06	C	P1	25	–	569.3	1676.7	48.1	79.6	320	30000	1
P14T–08	C	P1	25	–	–	–	47.7	78.3	320	30000	1
P11A–13	L	P1	25	299.0	646.8	1100.7	61.3	53.1	320	55000	1
P12A–25	L	P1	25	287.6	688.3	1463.6	60.9	60.3	320	55000	1
P12T–05	C	P1	25	276.8	610.8	1315.5	67.2	58.9	350	10000	2
P12T–06	C	P1	25	263.4	608.7	864.7	87.2	76.1	350	10000	2
P12A–08	L	P1	25	290.5	652.9	1625.9	–	75.2	350	10000	2
P12A–09	L	P1	25	271.2	618.0	2322.0	–	80.2	350	10000	2
P12T–11	C	P1	25	266.6	617.0	1240.0	47.7	61.0	350	30000	1
P12A–13	L	P1	25	285.0	637.0	1068.7	67.8	55.8	350	30000	1
P12A–14	L	P1	25	263.5	634.9	1648.8	44.1	70.3	350	30000	1
P13T–07	C	P1	25	285.0	660.0	1351.8	46.8	55.8	400	10000	2
P13A–07	L	P1	25	286.3	677.7	1429.8	68.6	56.4	400	10000	2
P13T–02	C	P1	290	148.5	408.8	642.2	33.3	43.9	Unaged	–	2
P14T–01	C	P1	290	157.0	437.5	622.3	32.6	46.4	Unaged	–	2
P11A–02	L	P1	290	159.9	442.7	497.0	35.5	36.7	Unaged	–	2
P13A–02	L	P1	290	155.0	424.4	850.8	43.0	67.2	Unaged	–	2
P14T–10	C	P1	290	166.1	415.3	769.1	35.4	64.0	290	30000	1
P11A–26	L	P1	290	160.3	394.6	605.7	51.3	73.6	290	30000	1
P14A–27	L	P1	290	167.8	421.6	812.5	29.4	60.1	290	30000	1
P11A–27	L	P1	290	167.1	388.4	843.0	34.8	60.1	290	58000	1
P11A–30	L	P1	290	179.3	445.5	683.6	39.5	46.6	290	58000	1
P11A–09	L	P1	290	175.5	435.1	934.6	29.4	59.1	320	30000	1
P12A–19	L	P1	290	174.8	456.9	731.1	27.4	51.6	320	30000	1
P12A–22	L	P1	290	175.4	418.7	629.7	24.5	46.6	320	30000	1

Table 3. (Contd.)

Specimen Number	Orien–tation[a]	Heat	Test Temp. (°C)	Engineering 0.2% Yield Stress (MPa)	Engineering Ultimate Stress (MPa)	Fracture Stress (MPa)	Elong–ation (%)	Red. in Area (%)	Aging Condition Temp. (°C)	Aging Condition Time (h)	Ref.[b]
P11A–12	L	P1	290	188.2	424.8	865.0	39.5	56.6	320	55000	1
P12A–26	L	P1	290	200.4	472.0	951.8	31.0	58.3	320	55000	1
P12T–08	C	P1	290	180.2	454.2	981.5	–	63.4	350	10000	2
P12A–10	L	P1	290	173.7	451.3	919.6	43.4	62.8	350	10000	2
P12A–11	L	P1	290	180.7	457.7	823.2	42.4	55.8	350	10000	2
P12T–12	C	P1	290	194.9	472.7	786.5	24.8	58.0	350	30000	1
P14A–22	L	P1	290	185.3	462.3	719.2	25.3	44.5	350	30000	1
P14A–23	L	P1	290	198.6	475.6	735.1	25.1	42.0	350	30000	1
P13T–08	C	P1	290	167.3	502.2	791.0	–	49.6	400	10000	2
P13A–08	L	P1	290	162.9	485.6	881.0	35.6	51.0	400	10000	2
683–40	H	68	25	274.1	530.0	996.8	45.4	53.4	Unaged	–	2
683–41	H	68	25	279.4	517.2	811.9	36.4	49.2	Unaged	–	2
683–33	H	68	25	263.1	502.3	2242.4	55.7	83.2	290	30000	1
684–31	H	68	25	269.2	531.5	2050.9	42.3	79.7	290	30000	1
68–145	V	68	25	278.0	566.4	1903.0	42.1	78.9	290	30000	1
684–21	H	68	25	304.5	614.1	1291.8	67.8	61.9	320	10000	1
684–22	H	68	25	281.0	571.2	1880.1	76.6	80.7	320	10000	1
682–41	H	68	25	305.7	621.0	1544.6	40.8	71.2	320	30000	1
684–39	H	68	25	358.2	614.4	1716.9	43.4	75.4	320	30000	1
68–264	V	68	25	296.2	572.5	1903.8	65.3	75.6	320	30000	1
681–28	H	68	25	326.9	640.3	1130.7	51.0	66.6	320	50000	1
681–29	H	68	25	303.7	608.4	1666.1	50.7	71.1	320	50000	1
68–230	V	68	25	294.3	578.9	1696.8	47.0	75.8	320	50000	1
682–25	H	68	25	281.5	601.6	1647.2	64.1	75.2	350	5780	2
682–26	H	68	25	294.8	599.4	1620.7	62.0	73.5	350	5780	2
684–06	H	68	25	264.5	606.5	2014.0	53.7	78.3	350	10000	1
684–07	H	68	25	299.7	601.1	1953.4	47.4	76.7	350	10000	1
684–08	H	68	25	296.8	612.0	2084.7	52.6	78.5	350	10000	1
68–129	V	68	25	287.6	595.8	1688.6	58.5	73.5	350	10000	1
684–10	H	68	25	299.0	652.8	2072.9	44.6	74.9	350	30000	1
684–11	H	68	25	281.1	628.2	1342.3	55.0	57.4	350	30000	1
68–139	V	68	25	287.4	639.0	2090.6	44.5	77.0	350	30000	1
682–16	H	68	25	294.1	657.8	1534.6	75.0	64.0	400	2570	2
682–17	H	68	25	289.8	629.5	1313.0	–	64.6	400	2570	2
682–15	H	68	25	313.4	641.0	1526.3	36.8	64.4	400	10000	1
682–22	H	68	25	299.3	650.4	1019.0	43.9	49.4	400	10000	1
682–23	H	68	25	306.0	657.4	941.5	31.8	42.2	400	10000	1
68–119	V	68	25	–	624.3	1926.8	44.0	72.9	400	10000	1
681–04	H	68	25	291.3	653.1	1030.9	41.5	38.7	450	2570	2
681–05	H	68	25	309.4	632.9	1447.0	–	68.7	450	2570	2
683–42	H	68	290	162.7	397.3	815.4	29.2	57.8	Unaged	–	2
684–40	H	68	290	156.4	412.3	792.0	37.9	60.6	Unaged	–	2
684–32	H	68	290	149.5	333.2	513.0	27.7	62.2	290	30000	1
684–33	H	68	290	155.0	399.6	784.0	43.8	62.6	290	30000	1
68–246	V	68	290	170.6	390.7	522.1	28.4	51.5	290	30000	1
684–23	H	68	290	173.4	416.6	1048.7	26.8	72.7	320	10000	1
684–24	H	68	290	164.4	442.8	869.9	32.6	58.2	320	10000	1
682–40	H	68	290	174.3	440.8	853.5	36.6	62.3	320	30000	1
682–42	H	68	290	176.9	451.6	788.3	38.1	59.6	320	30000	1
68–263	V	68	290	165.6	450.3	758.2	37.2	48.0	320	30000	1
682–28	H	68	290	203.3	479.0	1132.6	32.6	64.0	320	50000	1
682–29	H	68	290	205.3	485.6	824.2	41.4	47.1	320	50000	1
68–130	V	68	290	201.3	475.2	699.1	38.9	46.2	320	50000	1
682–27	H	68	290	185.1	452.4	826.3	41.7	57.8	350	5780	2
684–09	H	68	290	164.3	500.3	765.7	30.5	51.9	350	10000	1
68–130	V	68	290	168.9	447.2	765.4	27.0	49.9	350	10000	1

Table 3. (Contd.)

Specimen Number	Orien–tation[a]	Heat	Test Temp. (°C)	Engineering 0.2% Yield Stress (MPa)	Engineering Ultimate Stress (MPa)	Fracture Stress (MPa)	Elong–ation (%)	Red. in Area (%)	Aging Condition Temp. (°C)	Aging Condition Time (h)	Ref.[b]
684–12	H	68	290	216.0	485.7	888.0	29.6	53.9	350	30000	1
684–15	H	68	290	190.4	427.3	671.2	25.3	41.7	350	30000	1
68–140	V	68	290	170.2	479.0	482.8	31.6	53.6	350	30000	1
682–18	H	68	290	161.3	463.1	711.3	32.1	47.1	400	2570	2
682–24	H	68	290	176.7	475.6	800.8	34.4	47.6	400	10000	1
68–120	V	68	290	193.9	484.4	734.0	27.8	37.1	400	10000	1
681–06	H	68	290	169.7	486.8	700.4	–	36.8	450	2570	2
682–09	H	68	290	191.6	503.8	769.0	35.5	42.6	450	2570	2
733–40	H	73	25	254.3	557.0	882.9	46.5	41.3	Unaged	–	1
733–41	H	73	25	249.5	530.8	988.8	54.9	55.1	Unaged	–	1
734–23	H	73	25	221.9	475.4	1835.0	62.7	78.0	320	10000	1
734–24	H	73	25	228.2	521.4	1675.1	72.3	78.0	320	10000	1
732–25	H	73	25	244.0	526.5	1453.0	57.3	74.2	350	2570	1
732–26	H	73	25	244.4	528.4	1109.6	45.5	65.4	350	2570	1
734–06	H	73	25	228.0	536.9	1885.1	53.5	78.0	350	10000	1
734–07	H	73	25	219.1	529.3	2005.0	67.1	79.0	350	10000	1
73–119	H	73	25	212.8	488.1	2084.8	50.8	83.0	350	10000	1
732–16	H	73	25	240.8	541.8	1390.9	59.5	72.4	400	2570	1
732–17	H	73	25	252.6	555.7	1419.0	56.1	72.1	400	2570	1
732–15	H	73	25	235.3	563.3	2183.2	58.5	79.2	400	10000	1
732–22	H	73	25	215.8	530.3	1298.3	58.4	63.6	400	10000	1
73–109	V	73	25	222.2	534.0	1719.7	69.0	74.4	400	10000	1
731–04	H	73	25	256.5	493.1	944.5	34.4	53.1	450	2570	1
731–05	H	73	25	234.0	570.4	1511.4	75.2	69.3	450	2570	1
733–42	H	73	290	138.9	366.6	970.1	40.5	75.8	Unaged	–	1
734–40	H	73	290	133.9	365.0	599.5	33.0	54.0	Unaged	–	1
734–19	H	73	290	130.4	354.0	426.4	33.6	33.8	320	10000	1
734–22	H	73	290	131.3	365.2	743.5	45.7	61.1	320	10000	1
732–27	H	73	290	139.6	419.8	833.9	44.3	62.0	350	2570	1
734–08	H	73	290	127.7	377.7	964.3	40.7	68.6	350	10000	1
734–09	H	73	290	165.0	417.5	725.9	28.9	53.3	350	10000	1
73–120	V	73	290	136.7	386.4	835.4	35.5	69.0	350	10000	1
732–18	H	73	290	–	444.1	700.7	38.0	59.3	400	2570	1
732–23	H	73	290	138.5	408.5	683.8	39.7	50.0	400	10000	
732–24	H	73	290	143.0	424.1	649.8	32.7	40.2	400	10000	
73–110	V	73	290	139.4	395.8	696.5	37.4	51.7	400	10000	
731–06	H	73	290	144.1	411.2	596.6	24.8	39.2	450	2570	1
732–09	H	73	290	136.2	436.1	730.6	43.6	51.2	450	2570	1
					CF–8M Grade						
205–26	L	205	25	248.5	670.6	1227.7	36.3	65.0	400	18000	1
205–27	L	205	25	254.0	642.4	1694.1	49.0	71.2	400	18000	1
205–30	L	205	25	248.7	646.1	1576.7	41.8	70.6	400	18000	1
205–25	L	205	290	179.4	505.9	744.1	23.6	44.6	400	18000	1
205–28	L	205	290	177.3	507.8	790.3	27.0	49.2	400	18000	1
205–29	L	205	290	168.2	495.1	700.7	24.6	44.2	400	18000	1
743–40	H	74	25	273.5	542.4	1356.5	–	65.4	Unaged	–	1
743–41	H	74	25	273.0	531.3	1362.7	63.0	68.3	Unaged	–	1
743–36	H	74	25	282.2	555.6	2157.5	42.5	83.2	290	30000	1
744–34	H	74	25	292.9	601.2	1509.6	38.1	72.1	290	30000	1
74–135	V	74	25	259.0	570.4	1832.2	55.6	77.6	290	30000	1
744–21	H	74	25	273.1	551.0	1848.3	49.9	78.1	320	10000	1
744–25	H	74	25	270.5	565.3	2107.4	69.9	80.8	320	10000	1
742–42	H	74	25	312.7	589.9	1418.6	40.2	66.4	320	30000	1
744–39	H	74	25	326.4	663.6	1400.8	39.2	63.6	320	30000	1
74–245	V	74	25	278.8	617.0	1579.6	44.4	76.7	320	30000	1

Table 3. (Contd.)

Specimen Number	Orien–tation[a]	Heat	Test Temp. (°C)	Engineering 0.2% Yield Stress (MPa)	Engineering Ultimate Stress (MPa)	Fracture Stress (MPa)	Elong–ation (%)	Red. in Area (%)	Aging Condition Temp. (°C)	Aging Condition Time (h)	Ref.[b]
741–28	H	74	25	309.1	668.1	1056.7	42.2	52.7	320	50000	1
741–29	H	74	25	304.5	638.1	1506.5	48.3	62.9	320	50000	1
74–230	V	74	25	299.4	631.6	1623.1	47.1	68.7	320	50000	1
742–25	H	74	25	269.0	575.1	1380.5	58.9	68.1	350	2570	1
742–26	H	74	25	261.0	536.8	1517.5	62.5	72.0	350	2570	1
744–07	H	74	25	281.7	606.1	1498.4	57.1	63.8	350	10000	1
744–08	H	74	25	278.2	619.2	1903.6	38.7	74.0	350	10000	1
74–119	V	74	25	267.5	587.8	2081.4	49.3	80.9	350	10000	1
743–13	H	74	25	265.8	647.2	1198.4	55.6	51.8	350	30000	1
743–14	H	74	25	260.3	613.5	1375.6	39.5	63.8	350	30000	1
74–130	V	74	25	272.3	624.8	1334.6	37.6	60.0	350	30000	1
742–16	H	74	25	268.6	602.3	1409.4	44.1	70.8	400	2570	1
742–17	H	74	25	267.7	579.7	1308.7	41.7	71.8	400	2570	1
742–22	H	74	25	269.8	626.3	991.8	40.7	69.1	400	10000	1
742–23	H	74	25	267.7	624.3	1170.2	46.4	72.6	400	10000	1
74–110	V	74	25	259.2	607.9	1429.6	48.5	69.6	400	10000	1
741–04	H	74	25	257.5	620.5	1293.5	43.5	60.5	450	2570	1
741–05	H	74	25	259.1	616.7	1176.2	58.8	52.9	450	2570	1
744–40	H	74	290	171.8	412.3	557.7	25.3	58.7	Unaged	–	1
743–42	H	74	290	164.6	442.8	674.7	35.4	42.1	Unaged	–	1
744–35	H	74	290	193.8	424.7	1061.2	42.8	69.9	290	30000	1
744–36	H	74	290	165.2	424.1	810.8	35.1	54.9	290	30000	1
74–236	V	74	290	179.9	436.3	1433.8	29.2	76.4	290	30000	1
744–26	H	74	290	192.7	440.1	890.9	36.3	62.6	320	10000	1
744–27	H	74	290	181.0	420.6	831.2	35.8	56.9	320	10000	1
742–40	H	74	290	153.7	452.7	915.5	31.5	57.3	320	30000	1
742–41	H	74	290	190.3	483.3	748.7	24.0	42.5	320	30000	1
74–246	V	74	290	184.4	481.7	839.4	33.5	52.5	320	30000	1
742–28	H	74	290	203.5	473.3	884.5	33.7	53.1	320	50000	1
742–29	H	74	290	215.2	474.4	743.6	24.3	41.2	320	50000	1
74–130	V	74	290	235.4	517.7	741.1	29.5	34.2	320	50000	1
742–27	H	74	290	174.9	454.3	787.2	31.5	65.9	350	2570	1
744–06	H	74	290	185.4	448.0	677.7	28.0	38.7	350	10000	1
744–09	H	74	290	197.8	507.2	889.6	34.2	52.4	350	10000	1
74–120	V	74	290	176.6	453.8	751.0	33.3	48.3	350	10000	1
744–18	H	74	290	228.5	510.5	791.9	27.6	40.3	350	30000	1
743–15	H	74	290	180.0	503.8	830.7	34.0	49.9	350	30000	1
74–270	H	74	290	182.2	495.0	729.9	31.2	40.2	350	30000	1
742–18	H	74	290	166.2	485.1	695.0	28.5	57.1	400	2570	1
742–15	H	74	290	178.9	516.0	–	33.7	–	400	10000	1
742–24	H	74	290	184.2	509.1	848.8	29.9	48.9	400	10000	1
74–109	V	74	290	172.0	476.8	546.4	33.3	48.7	400	10000	1
741–06	H	74	290	172.0	500.7	678.6	22.9	45.5	450	2570	1
742–09	H	74	290	170.3	485.2	697.5	21.3	35.8	450	2570	1
753–40	H	75	25	313.5	610.4	1056.6	47.4	67.9	Unaged	–	1
753–41	H	75	25	330.5	589.8	931.7	39.9	74.9	Unaged	–	1
753–30	H	75	25	315.6	609.0	1668.9	37.2	75.0	290	30000	1
754–28	H	75	25	321.7	619.2	1140.2	48.3	70.5	290	30000	1
75–135	V	75	25	310.6	630.4	1448.9	48.3	69.7	290	30000	1
754–21	H	75	25	355.9	693.7	1822.9	58.5	75.0	320	10000	1
754–25	H	75	25	406.3	706.0	1763.9	46.4	71.2	320	10000	1
752–41	H	75	25	357.9	726.8	1224.7	38.8	52.4	320	30000	1
754–39	H	75	25	395.1	722.5	1203.2	39.2	52.5	320	30000	1
75–245	V	75	25	323.1	691.3	1418.1	47.5	62.2	320	30000	1
751–28	H	75	25	334.7	689.5	1118.9	28.1	40.8	320	50000	1
751–29	H	75	25	352.0	729.8	1166.6	27.0	43.2	320	50000	1

Table 3. (Contd.)

Specimen Number	Orien–tation[a]	Heat	Test Temp. (°C)	Engineering 0.2% Yield Stress (MPa)	Engineering Ultimate Stress (MPa)	Fracture Stress (MPa)	Elong–ation (%)	Red. in Area (%)	Aging Condition Temp. (°C)	Aging Condition Time (h)	Ref.[b]
75–230	V	75	25	378.4	759.5	1179.8	32.7	38.6	320	50000	1
752–25	H	75	25	–	667.8	1677.6	37.5	68.4	350	2570	1
752–26	H	75	25	346.5	688.9	1522.3	37.6	64.6	350	2570	1
754–06	H	75	25	332.7	741.1	1543.1	41.4	59.6	350	10000	1
754–07	H	75	25	352.5	728.5	1159.6	39.5	54.2	350	10000	1
754–08	H	75	25	308.6	718.8	1455.1	42.3	56.1	350	10000	1
75–119	V	75	25	354.0	742.8	1437.7	44.4	53.6	350	10000	1
753–10	H	75	25	316.1	766.4	1256.0	31.5	41.4	350	30000	1
753–11	H	75	25	344.3	748.2	1051.8	26.3	31.6	350	30000	1
75–130	V	75	25	300.8	711.0	1061.3	30.5	34.9	350	30000	1
752–16	H	75	25	326.7	703.6	1531.0	38.5	64.3	400	2570	1
752–17	H	75	25	353.1	731.5	1441.4	33.5	64.0	400	2570	1
752–15	H	75	25	405.3	777.1	1305.1	36.4	45.0	400	10000	1
752–22	H	75	25	–	749.1	1093.5	28.1	37.6	400	10000	1
752–23	H	75	25	338.9	726.6	1328.9	26.7	53.6	400	10000	1
75–109	V	75	25	359.0	736.8	1171.8	38.1	46.3	400	10000	1
751–04	H	75	25	311.7	721.2	1094.2	25.1	38.4	450	2570	1
751–05	H	75	25	314.7	746.4	1217.2	32.0	41.6	450	2570	1
754–40	H	75	290	196.8	470.8	652.0	26.1	63.1	Unaged	–	1
753–42	H	75	290	191.5	474.8	620.7	30.5	45.0	Unaged	–	1
754–29	H	75	290	193.3	528.3	1051.1	33.5	60.5	290	30000	1
754–30	H	75	290	202.6	495.3	784.9	31.1	58.5	290	30000	1
75–236	V	75	290	211.8	486.2	924.1	32.0	58.2	290	30000	1
754–26	H	75	290	205.6	538.0	945.5	28.9	64.7	320	10000	1
754–27	H	75	290	212.2	534.3	957.8	29.2	64.6	320	10000	1
752–40	H	75	290	231.7	589.3	852.7	26.0	38.4	320	30000	1
752–42	H	75	290	268.5	575.8	893.6	22.9	46.0	320	30000	1
75–246	V	75	290	213.0	521.8	881.3	26.7	54.2	320	30000	1
752–28	H	75	290	258.9	587.9	933.6	24.4	43.2	320	50000	1
752–29	H	75	290	264.1	581.7	969.4	23.2	48.5	320	50000	1
75–130	V	75	290	239.6	557.8	889.5	24.7	38.9	320	50000	1
752–27	H	75	290	204.7	528.8	843.9	25.8	49.4	350	2570	1
754–09	H	75	290	219.8	614.1	918.6	24.5	44.8	350	10000	1
75–120	V	75	290	209.9	595.6	854.7	32.7	35.4	350	10000	1
753–12	H	75	290	264.4	615.9	809.3	23.0	30.2	350	30000	1
754–12	H	75	290	227.2	613.8	839.4	24.2	31.2	350	30000	1
75–270	V	75	290	209.0	584.6	823.5	26.2	32.9	350	30000	1
752–18	H	75	290	203.2	591.1	799.6	26.4	41.0	400	2570	1
752–24	H	75	290	208.2	630.4	858.4	23.7	31.4	400	10000	1
75–110	V	75	290	206.7	593.1	884.1	25.3	42.4	400	10000	1
751–06	H	75	290	218.7	598.2	749.6	24.3	24.7	450	2570	1
752–09	H	75	290	197.7	606.2	888.1	25.5	33.0	450	2570	1

[a] Designation L = longitudinal or axial direction, C = circumferential direction, H = horizontal direction in the plane of the slab, and V = vertical direction transverse to the plane of the slab.

[b] Heats I, P2, P1, KRB, and 205 are commercial and Heats 69, 68, 73, 74, and 75 are experimental.

[c] 1: Argonne National Laboratory
2: Materials Engineering Associates

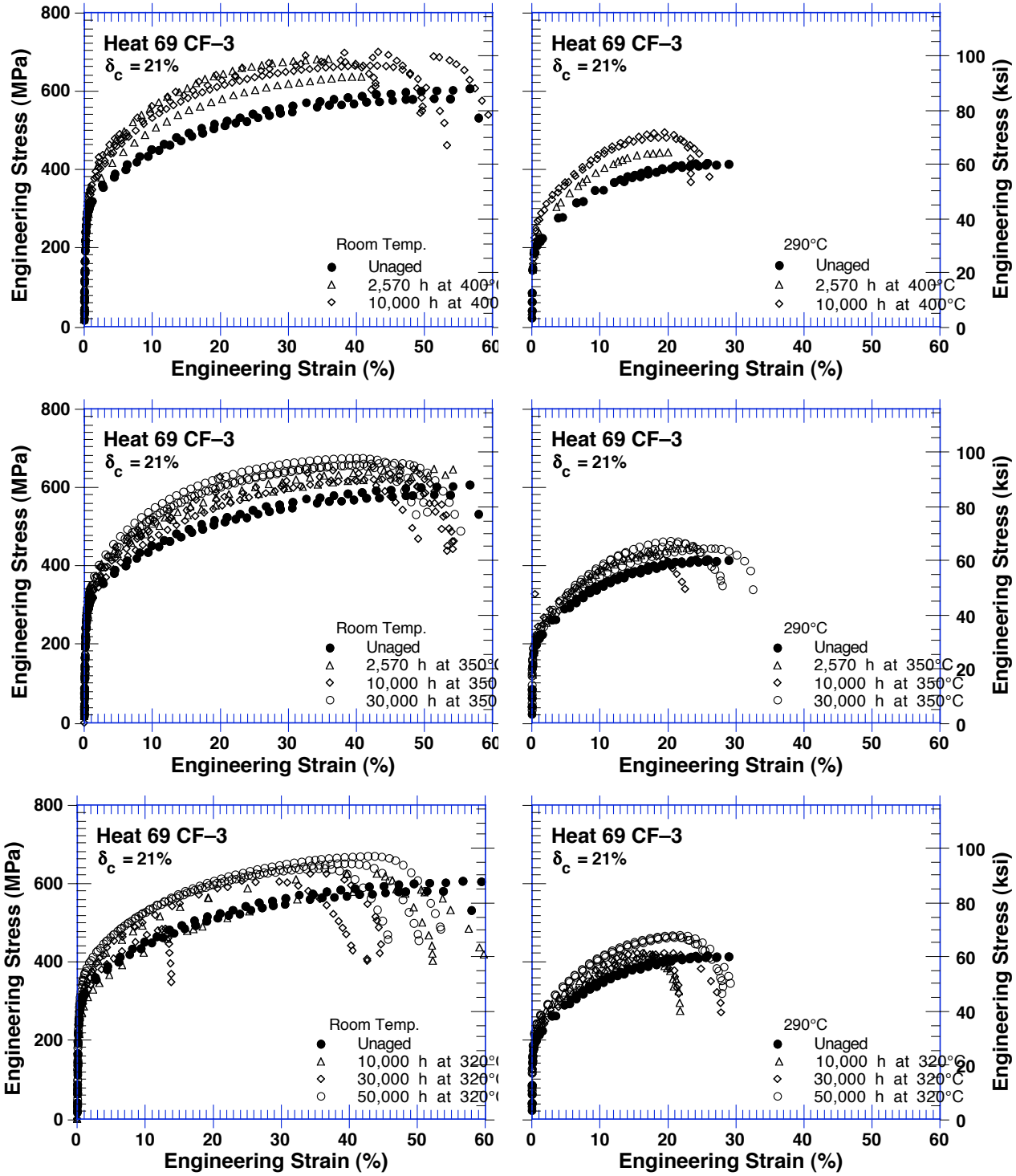


Figure 9. Effect of thermal aging on engineering stress vs. strain curves for Heat 69

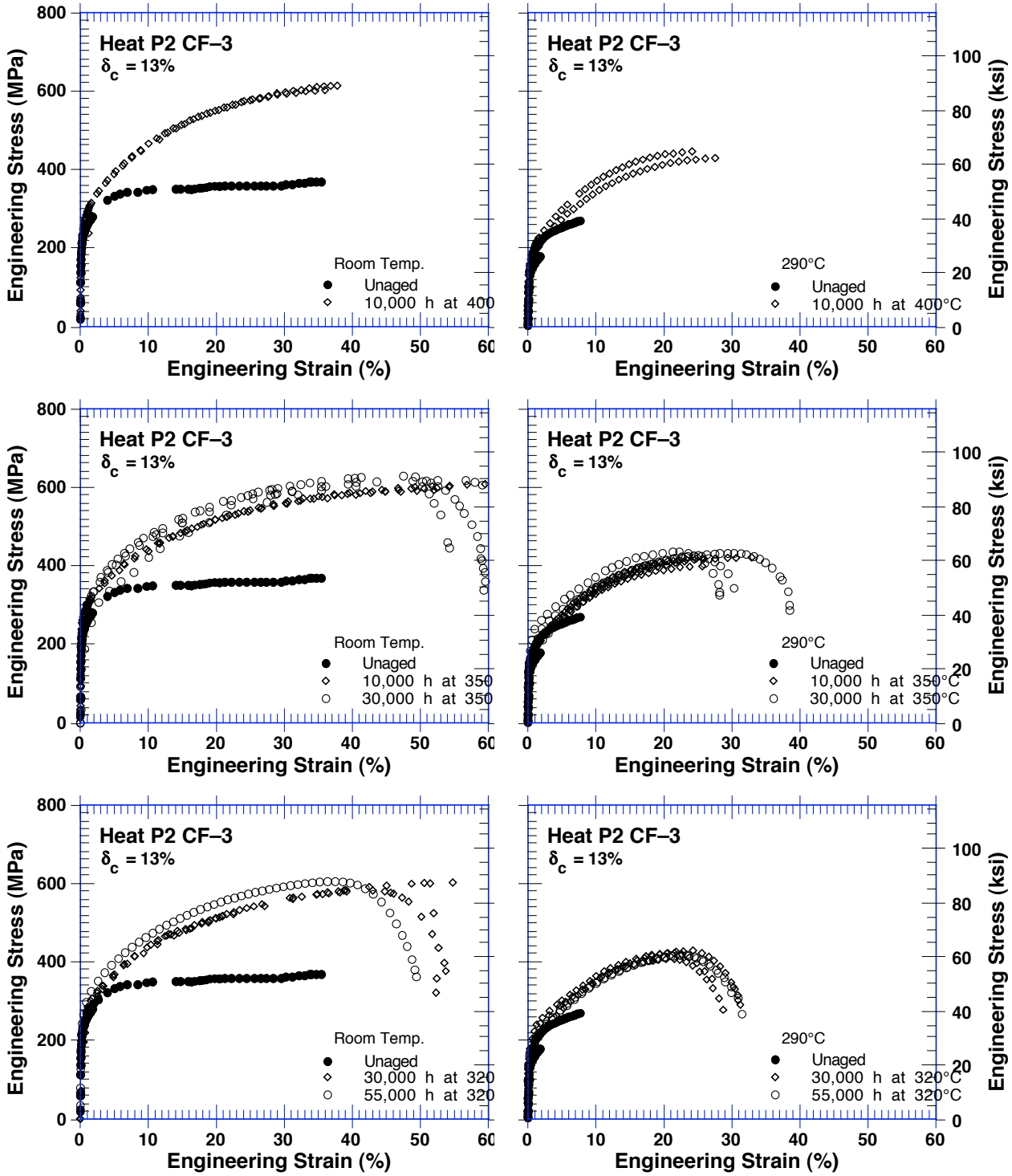


Figure 10. Effect of thermal aging on engineering stress vs. strain curves for Heat P2

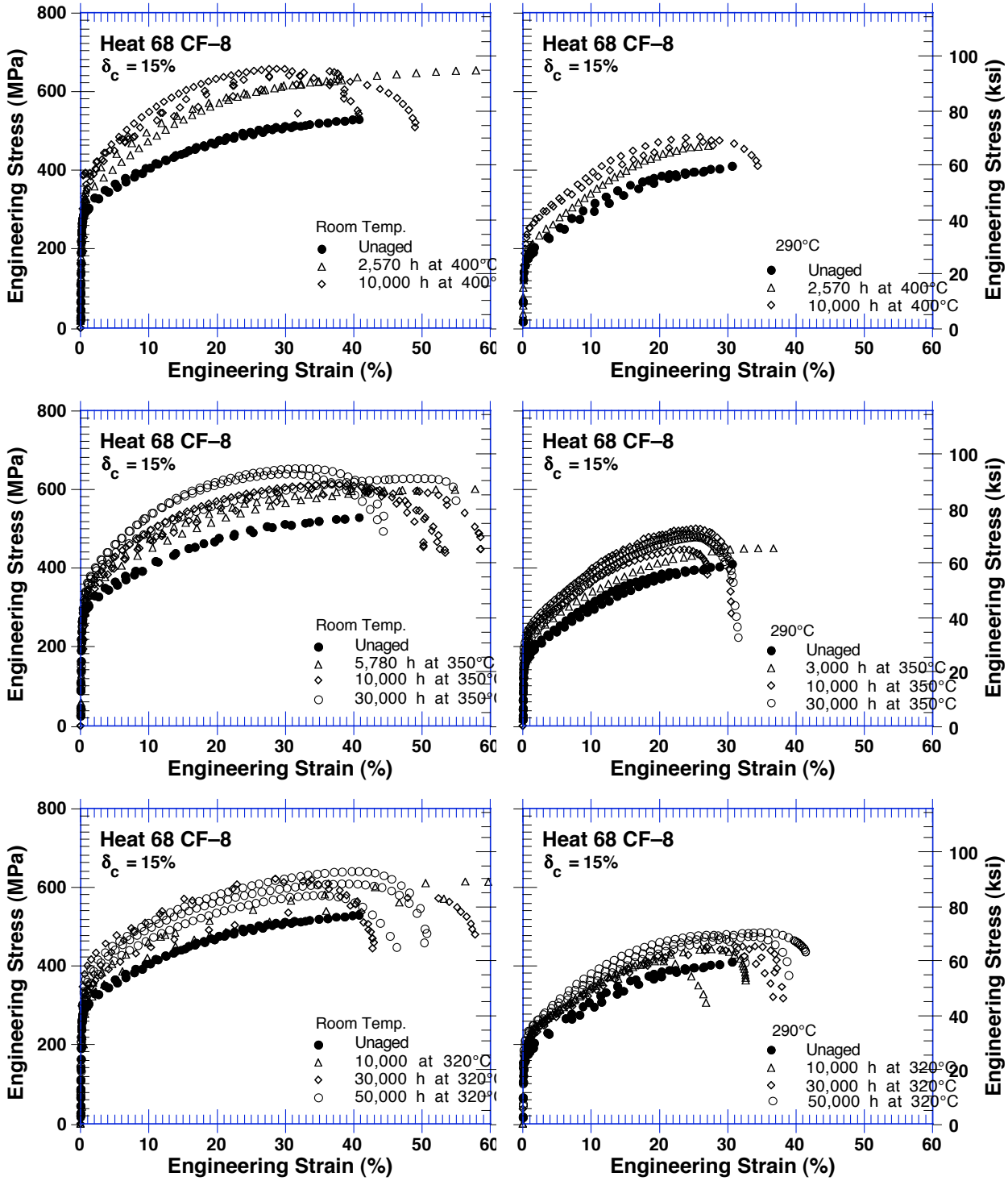


Figure 11. Effect of thermal aging on engineering stress vs. strain curves for Heat 68

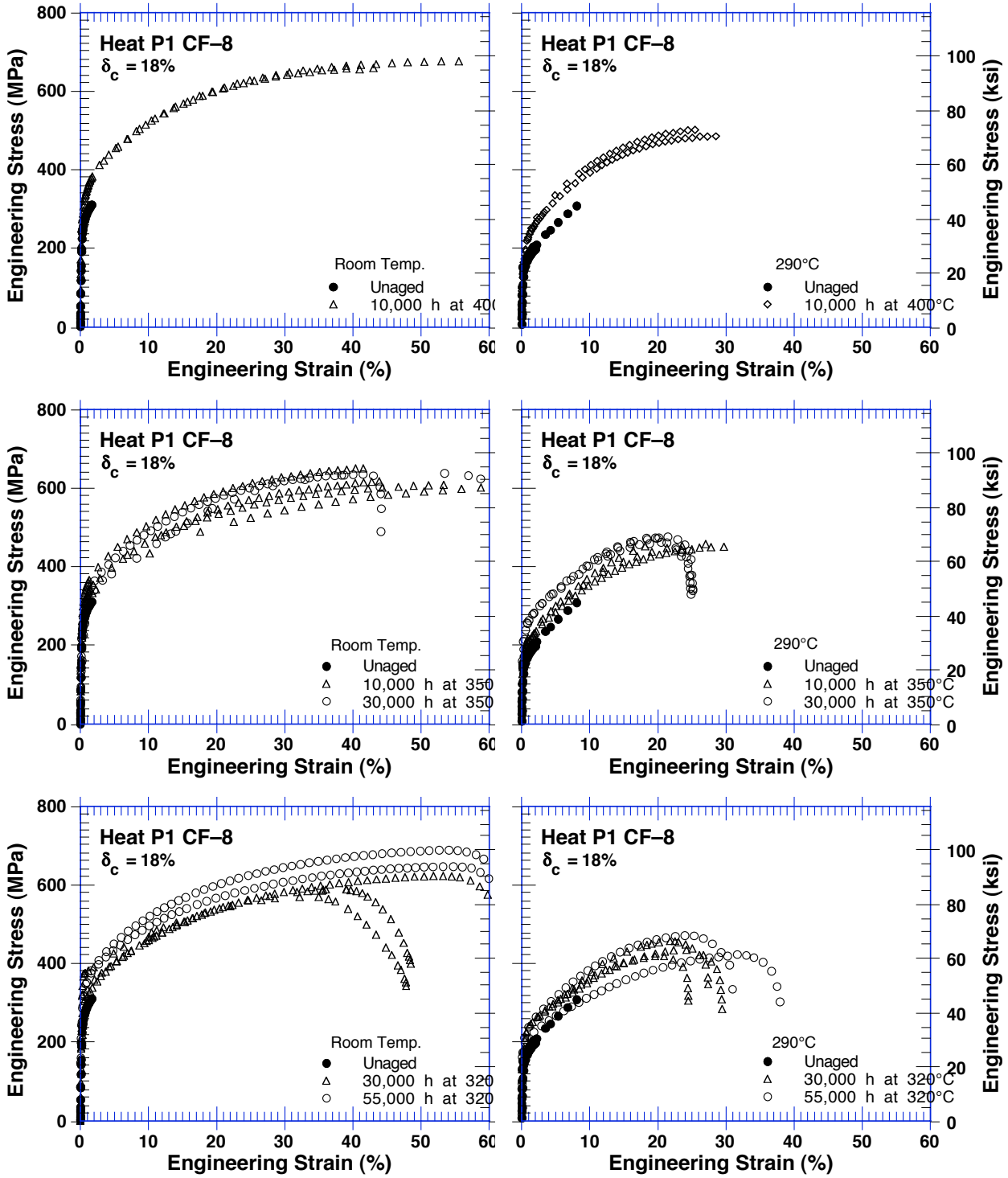


Figure 12. Effect of thermal aging on engineering stress vs. strain curves for Heat P1

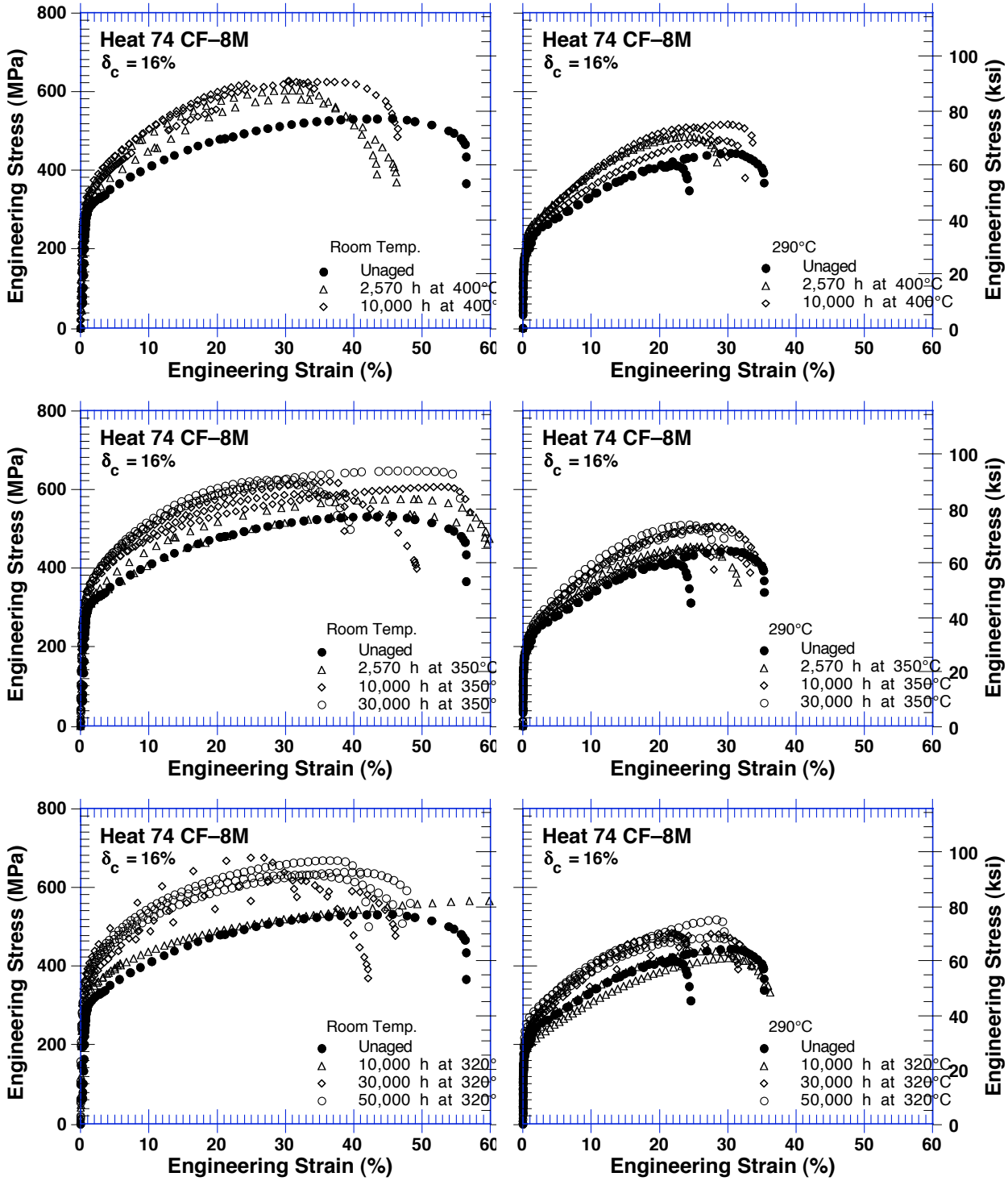


Figure 13. Effect of thermal aging on engineering stress vs. strain curves for Heat 74

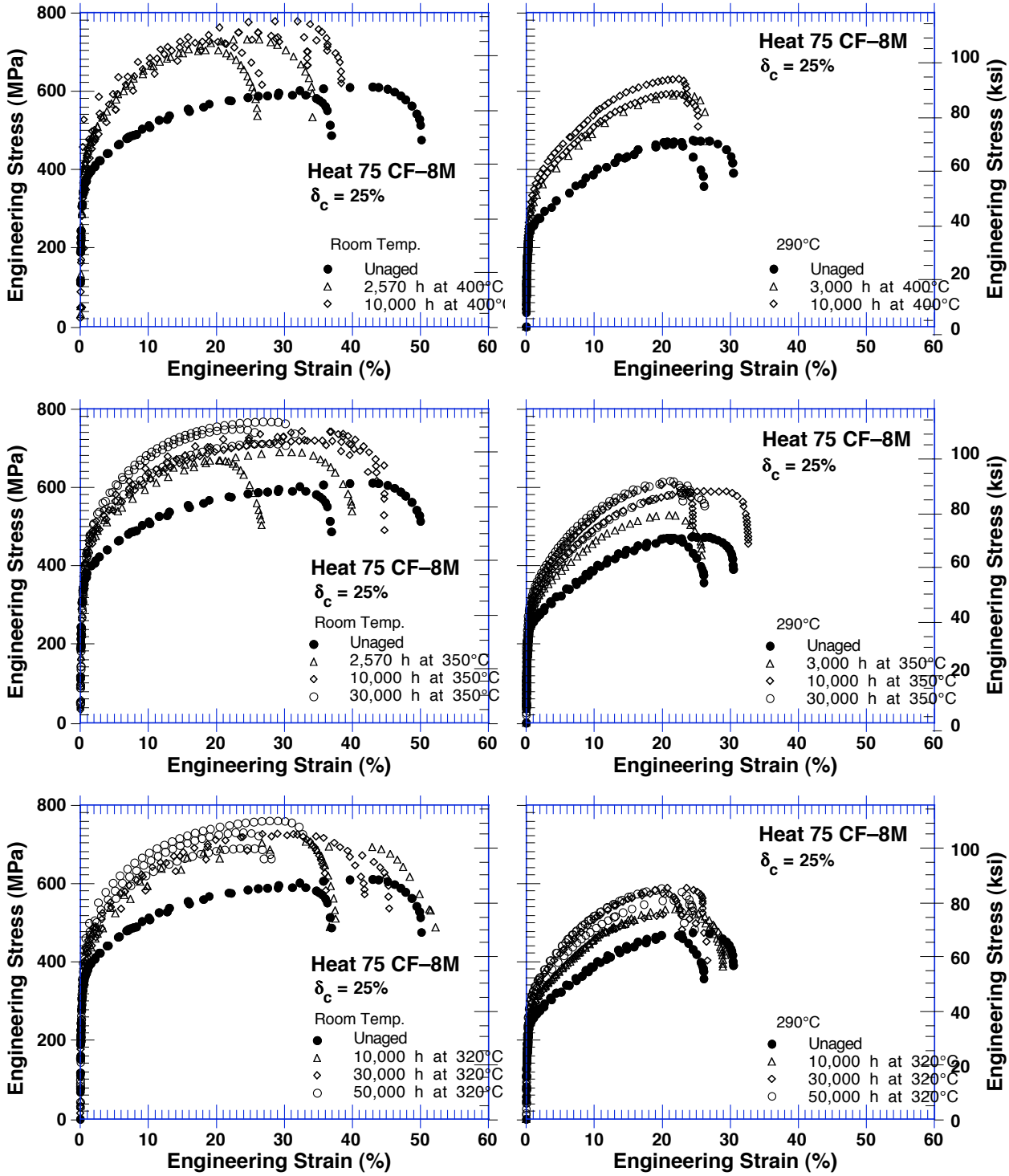


Figure 14. Effect of thermal aging on engineering stress vs. strain curves for Heat 75

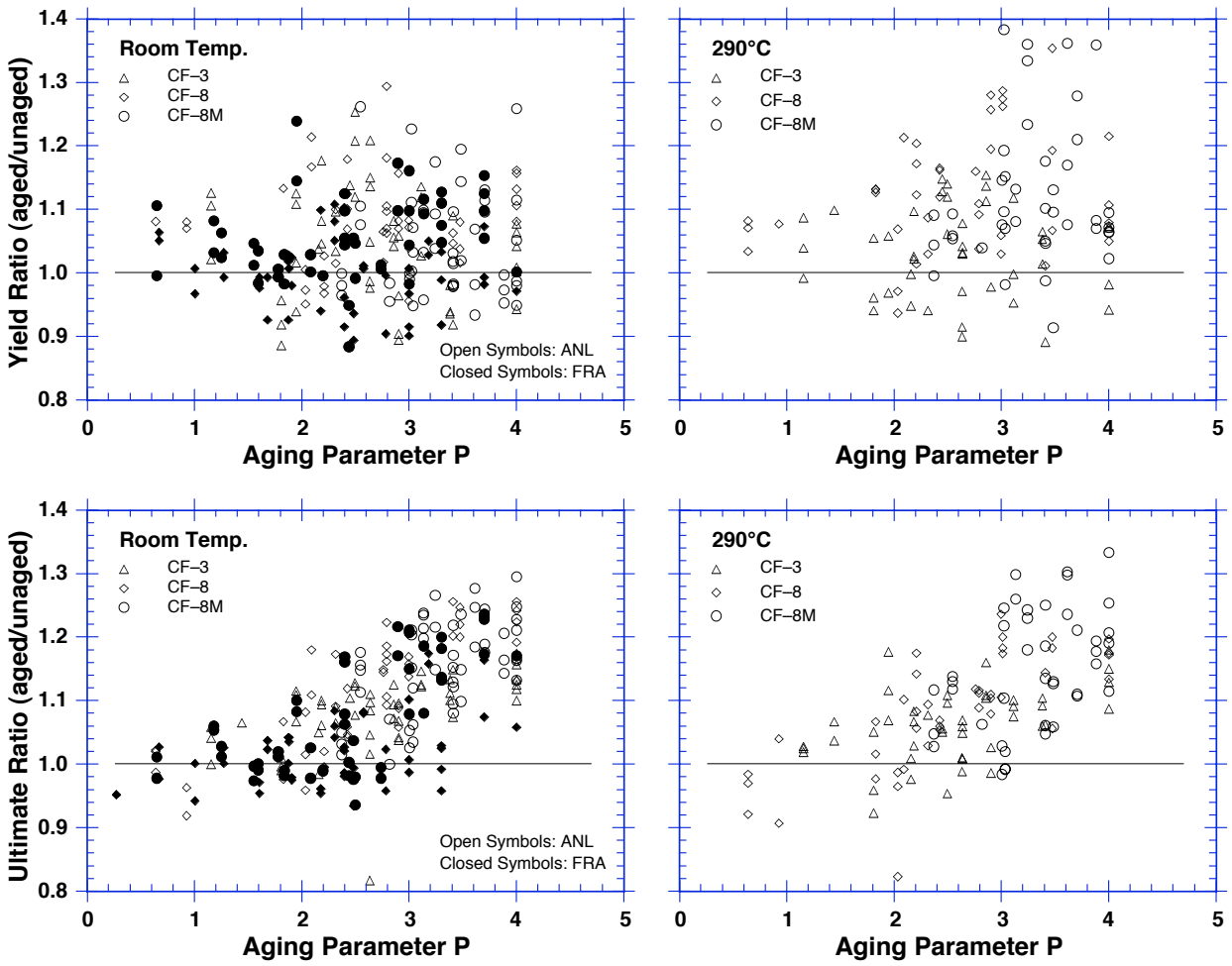


Figure 15. Ratio of yield and ultimate stress of aged and unaged cast stainless steel as a function of the aging parameter P

temperatures, thermal aging led to an increase in yield and ultimate stress and a slight decrease in ductility. For all heats, the increase in ultimate stress is substantially greater than the increase in yield stress. The Mo–bearing CF–8M steels are the most sensitive to thermal aging and Mo–free low–C CF–3 steels the least sensitive. Some heats show no change in yield stress. Furthermore, specimens aged for short times at high temperatures, e.g., ≈3,000 h at 400 (752°F), often show a decrease in yield stress.

The ratios of the yield and ultimate stress of aged and unaged cast stainless steels at room temperature and 290°C (554°F) are plotted as a function of the aging parameter P in Fig. 15. The results from tensile tests conducted at FRA[15] are also shown in the figure. The aging parameter P is determined from the equation

$$P = \log_{10}[t] - \frac{1000Q}{19.143}\left[\frac{1}{T_s + 273} - \frac{1}{673}\right], \qquad (1)$$

where Q is the activation energy and t and T_s are the time and temperature of aging, respectively. Equation 1 considers aging at 400°C as the baseline aging behavior for the material and

parameter P is the log of the aging time at 400°C. Activation energies for the various heats of cast stainless steel were obtained from room–temperature Charpy–impact data for materials that were aged up to 30,000 h at 290–400°C.[5,6]

The data show considerable scatter, particularly for the yield stress. However, for the various heats of cast stainless steel, increases in yield and ultimate stress are observed for P values of 1.5–2.5, which correspond to aging times of 30–300 h at 400°C. The increase in ultimate stress is substantially greater than the increase in yield stress. The changes in yield and ultimate stress range from –10 to 20% and from –5 to 25%, respectively. These results are consistent with the Charpy data, i.e., for a specific heat, an increase in tensile stress corresponds to a decrease in impact energy.

Photomicrographs of the fracture surface of unaged and aged Heats P1, 68, and 75, tested at room temperature and 290°C, are shown in Figs. 16–18. In most cases, the fracture mode was predominantly a dimpled ductile failure, particularly for the unaged materials. The aged materials showed some cleavage and, in addition, the high–C steels, e.g., Heats 68 and P1, exhibit phase boundary separation.

Tensile properties of the cast materials can also be obtained from Charpy–impact data. For a Charpy specimen, the yield stress is estimated from the expression

$$\sigma_y = CP_yB / Wb^2, \tag{2}$$

taken from Ref. 28, where Py is the yield load, W is the specimen width, B is the specimen thickness, b is the uncracked ligament, and C is a constant. The yield load was obtained from load–time traces of the Charpy tests. Deviation from linearity in the load–time traces occurred at 125–150 μs for the various heats. The load at 200 μs was estimated to represent 0.2% yield stress. Ultimate stress was also obtained from impact data by means of Eq. 2 and the maximum load. The constant C was determined by comparing tensile and Charpy–impact data. The best values of the constant were 1.50 and 2.36 for yield stress and ultimate stress, respectively. The estimated values of tensile stress are based on the assumption that strain rate effects are approximately the same for all heats and aging conditions. The estimated values of tensile stress are not accurate at temperatures corresponding to lower–shelf and transition regions. The estimated values of yield and ultimate stress for Heats 68, 69, 74, and 75, along with the values obtained from actual tensile tests, are shown in Fig. 19. The estimated tensile properties are in good agreement with the measured values.

4.2 Engineering Stress–Strain Behavior

Thermal aging increases the strain–hardening rate of all grades of cast stainless steel. The increase is greater at room temperature than at 290°C, and CF–8M steels show a larger increase than do Mo–free grades of steel (Figs. 9–14). The influence of thermal aging on tensile stress–strain behavior of cast stainless steels was evaluated by fitting the engineering stress (σ) vs. strain (ε) data with the RO equation

$$\frac{\varepsilon}{\varepsilon_o} = \frac{\sigma}{\sigma_o} + \alpha\left(\frac{\sigma}{\sigma_o}\right)^n, \tag{3}$$

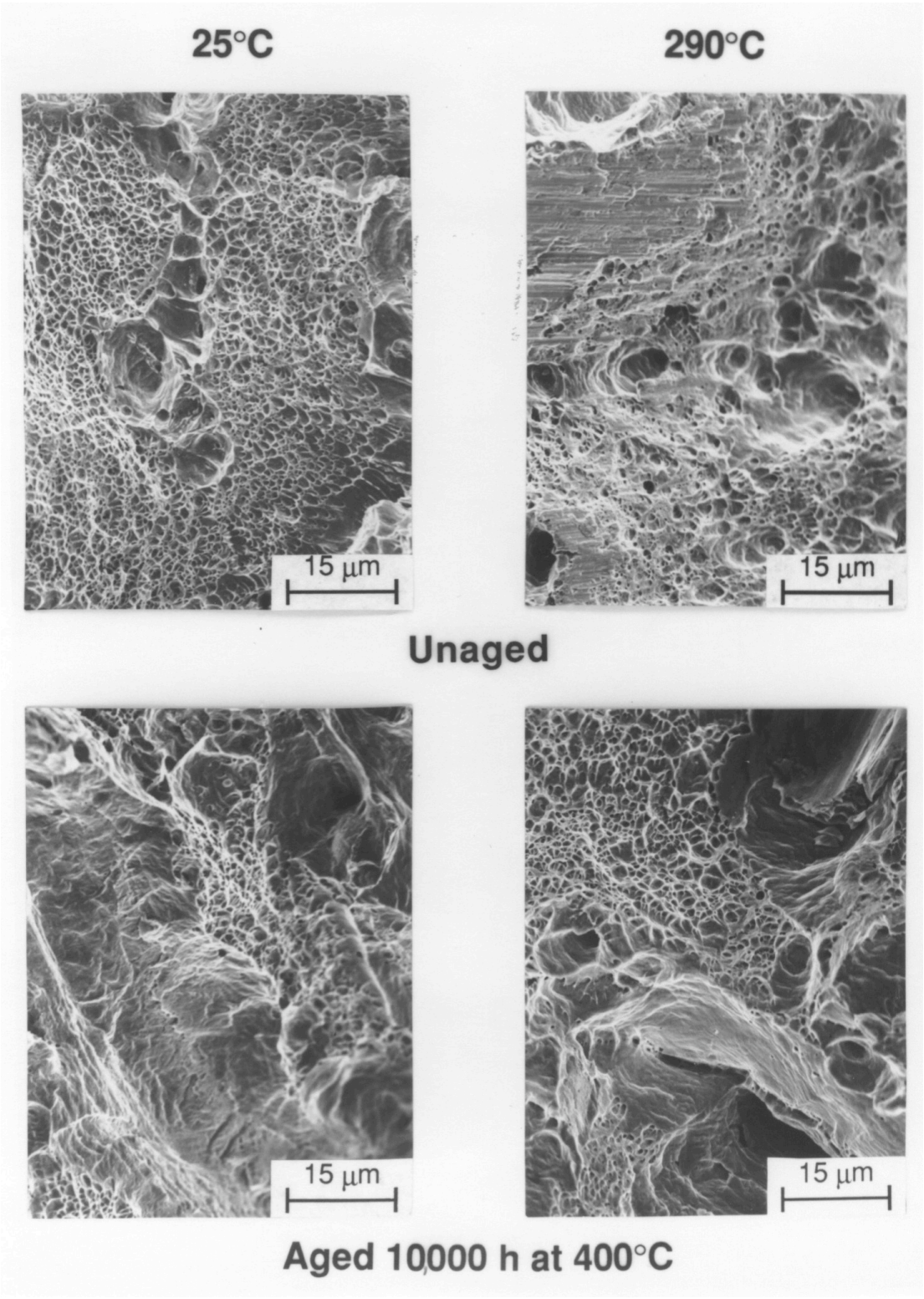


Figure 16. Fracture surface of tensile specimens of unaged and aged Heat P1 tested at room temperature and 290°C

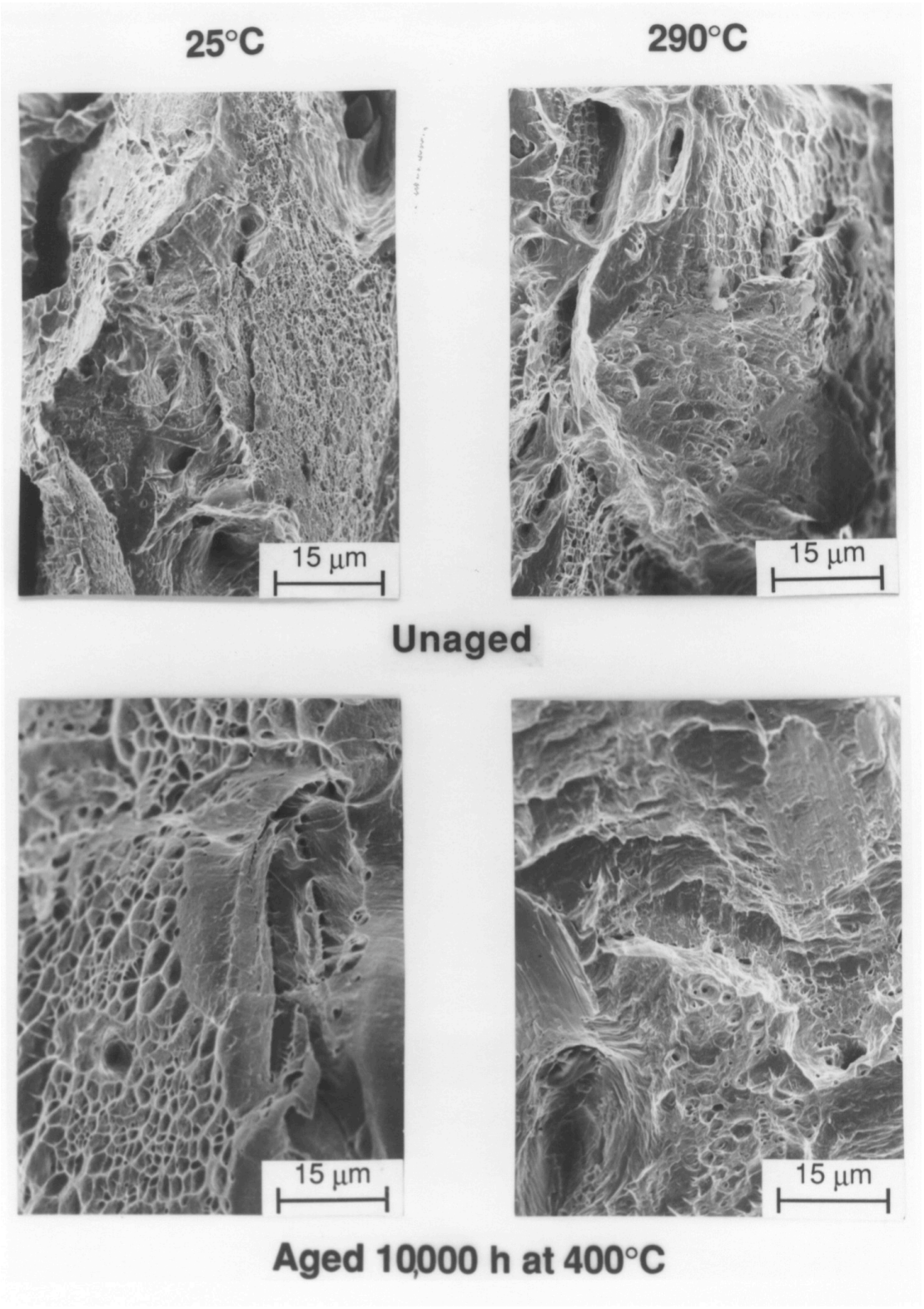


Figure 17. Fracture surface of tensile specimens of unaged and aged Heat 68 tested at room temperature and 290°C

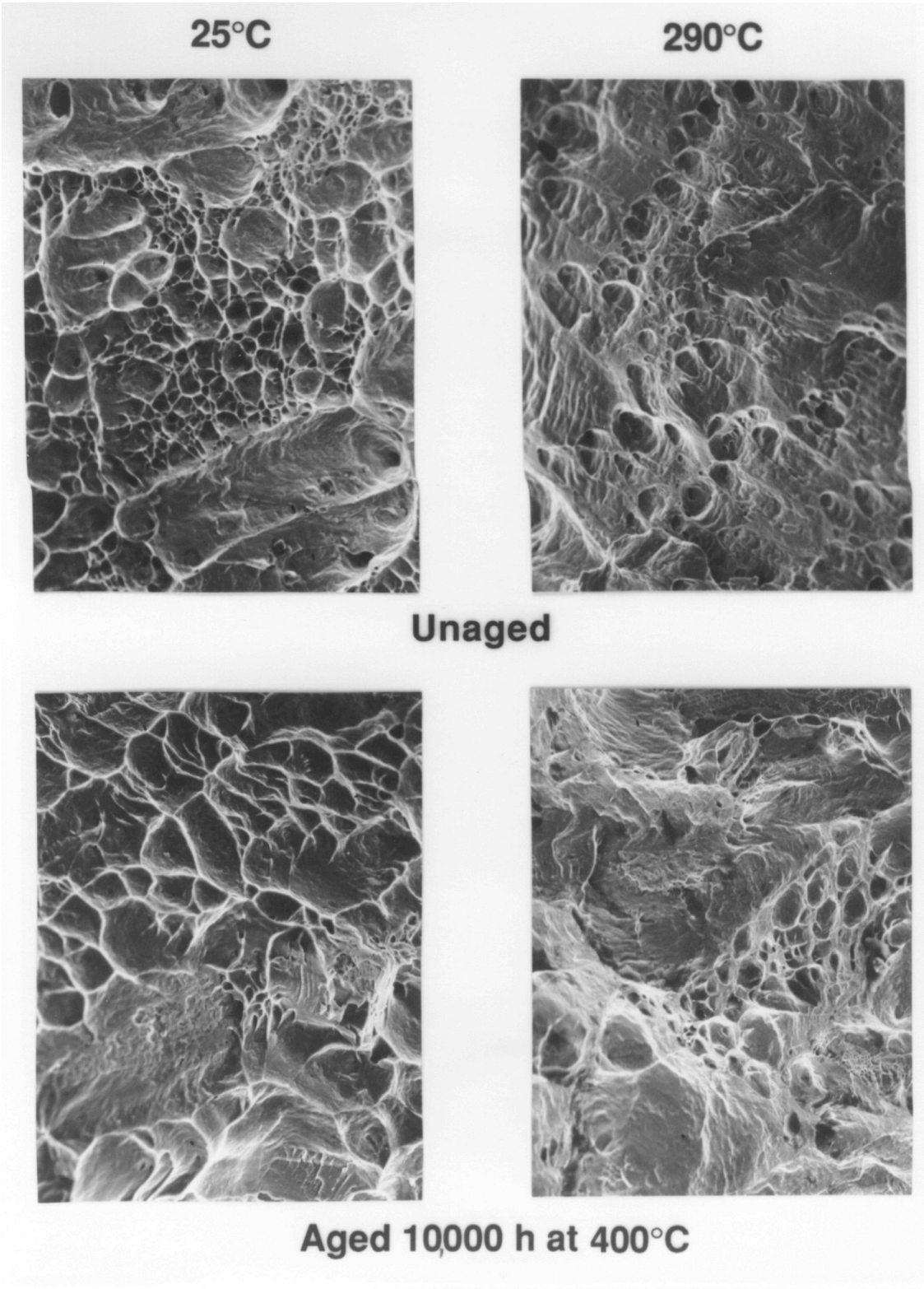


Figure 18. Fracture surface of tensile specimens of unaged and aged Heat 75 tested at room temperature and 290°C

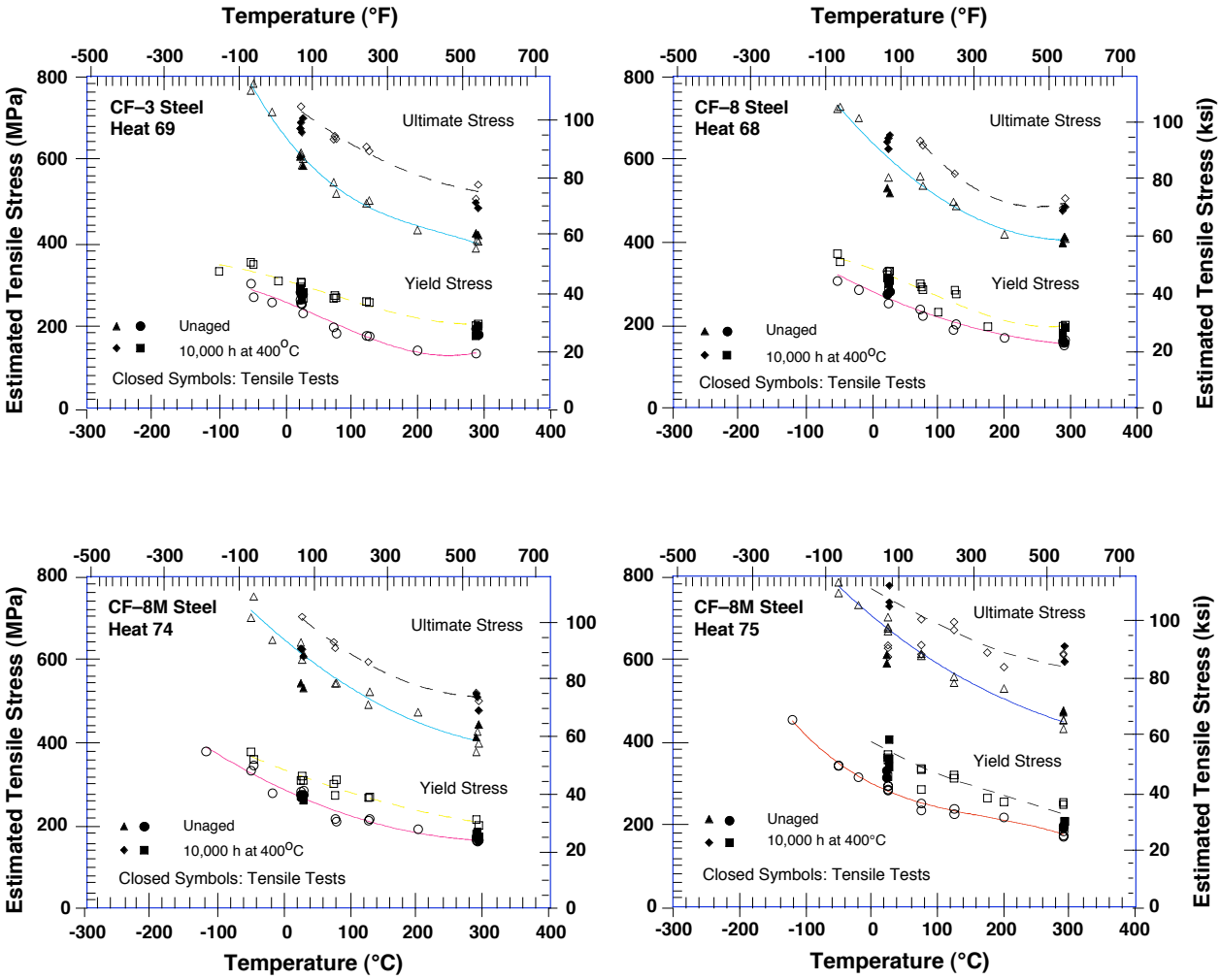


Figure 19. Values of yield and ultimate stress estimated from Charpy–impact data and those obtained from tensile tests for Heats 69, 68, 74, and 75

where σ_o is an arbitary reference stress, often assumed to be equal to flow or yield stress; the reference strain $\varepsilon_o = \sigma_o/E$; α and n are RO parameters; and E is elastic modulus. The RO equation can be rearranged to the form

$$\frac{E\varepsilon - \sigma}{\sigma_o} = \alpha\left(\frac{\sigma}{\sigma_o}\right)^n, \tag{4}$$

which is more convenient for fitting stress vs. strain data; α can be determined at $\sigma/\sigma_o = 1$ and n can be obtained from the slope of the log–log plot of Eq. 4. For each test, the RO parameters were obtained from the best–fit of the tensile data to Eq. 4, with flow stress σ_f as the reference stress

$$\frac{E\varepsilon - \sigma}{\sigma_f} = \alpha_1\left(\frac{\sigma}{\sigma_f}\right)^{n_1}, \tag{5}$$

and also with yield stress σ_y as the reference stress

$$\frac{E\varepsilon - \sigma}{\sigma_y} = \alpha_2 \left(\frac{\sigma}{\sigma_y} \right)^{n_2} . \qquad (6)$$

The ROFIT computer program developed by Battelle* was used for the analyses. For each reference stress, three different sets of values of the RO parameters were obtained from the best fit of the engineering stress–vs.–strain data for <5% strain, <15% strain, and the entire strain range of the test. Typical examples of the ROFIT analyses with σ_f as the reference stress are shown in Fig. 20. The best–fit values of the constant for all the tensile tests are given in Tables 4 and 5. As expected, the exponents n_1 and n_2 are the same from the two analyses, where σ_f or σ_y are used as the reference stress. The parameters α_1 and α_2 follow the relationship

$$\alpha_2 = \alpha_1 \left(\frac{\sigma_y}{\sigma_f} \right)^{n_1 - 1} \qquad (7)$$

and can be determined from one another. The results indicate that the exponent n_1 or n_2 does not change with thermal aging and differs for the three grades of steel. The parameters α_1 and α_2 decrease with thermal aging.

5 Estimation of Tensile Properties

5.1 Flow Stress

Tensile flow stress of aged cast stainless steels can be estimated from the correlation between the ratio of the tensile flow stress of aged and unaged cast stainless steels and a normalized aging parameter. Correlations have been developed for estimating the tensile flow stress of aged cast stainless steels from the kinetics of thermal embrittlement.[6] The ratio of the tensile flow stress of aged and unaged cast stainless steels at room temperature and 290°C (554°F) is plotted as a function of a normalized aging parameter in Fig. 21. Flow stress is characterized as the mean of the 0.2% yield stress and ultimate stress, and the aging parameter is normalized with respect to a θ value of 2.9. The aging parameter P was determined from Eq. 1 and experimental values of activation energy. At both temperatures, the flow stress ratio increased with thermal aging; the increase in flow stress of CF–3 steels was the smallest and that of CF–8M steels the largest. The correlations (shown as solid lines in Fig. 21) were obtained by subtracting one times the standard deviation for the fit to the data from the best–fit curve. The tensile–flow–stress ratio $R_f = (\sigma_{f_{aged}}/\sigma_{f_{unaged}})$, is given by

$$R_f = a_1 + b_1 P \qquad \left(1.00 \le R_f \le c_1\right). \qquad (8)$$

Values of the constants a_1, b_1, and c_1 for various grades of steel and test temperatures are given in Table 6. Equation 8 is valid for R_f values between 1 and c_1, service temperatures

* ROFIT (Version 1.0) computer program for IBM PC developed by Battelle Columbus for the U.S. Nuclear Regulatory Commission. Contact N. D. Ghadiali.

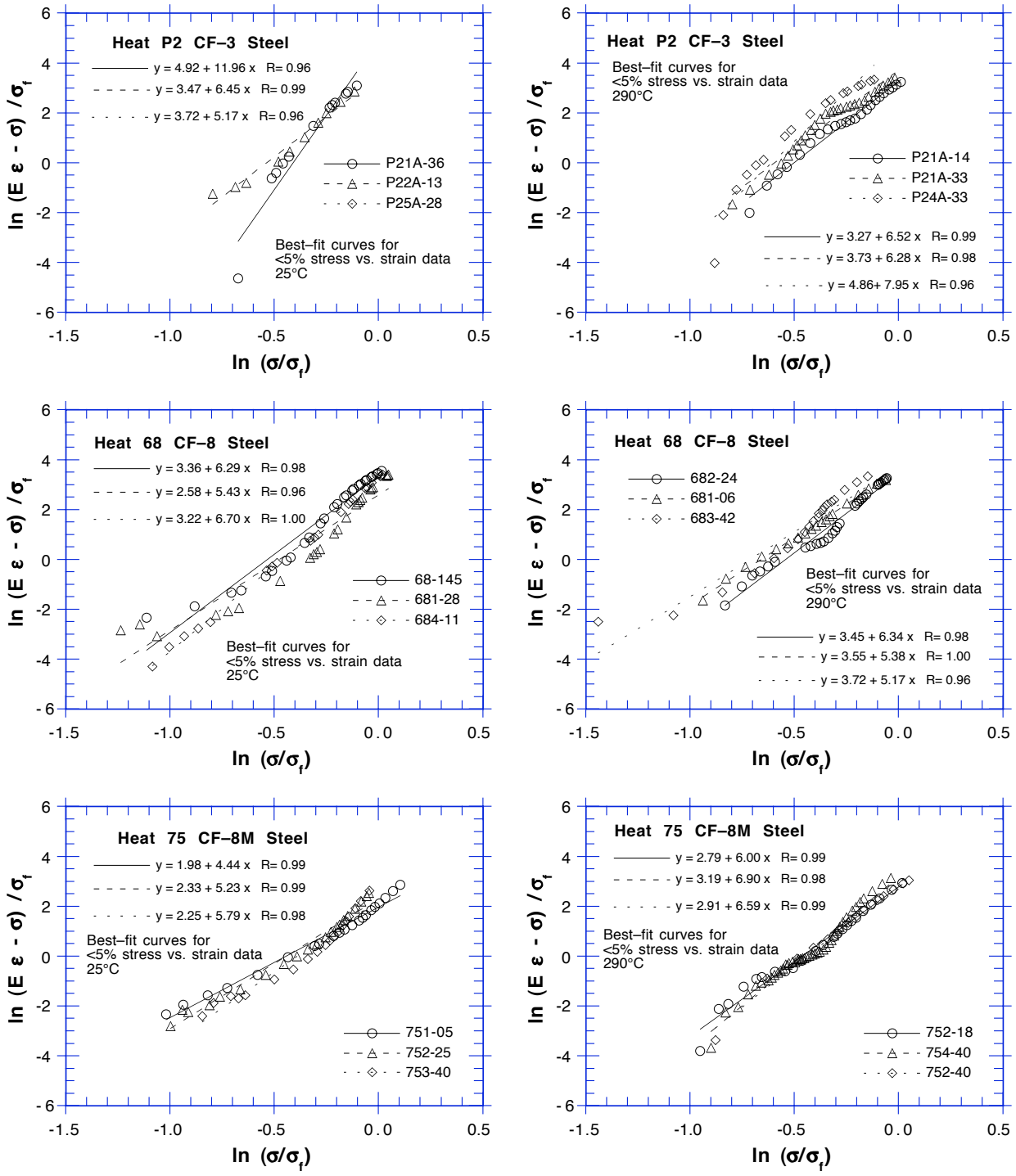


Figure 20. Examples of ROFIT analysis of tensile stress–vs.–strain curves at room temperature and 290°C for cast stainless steels using flow stress as the reference stress

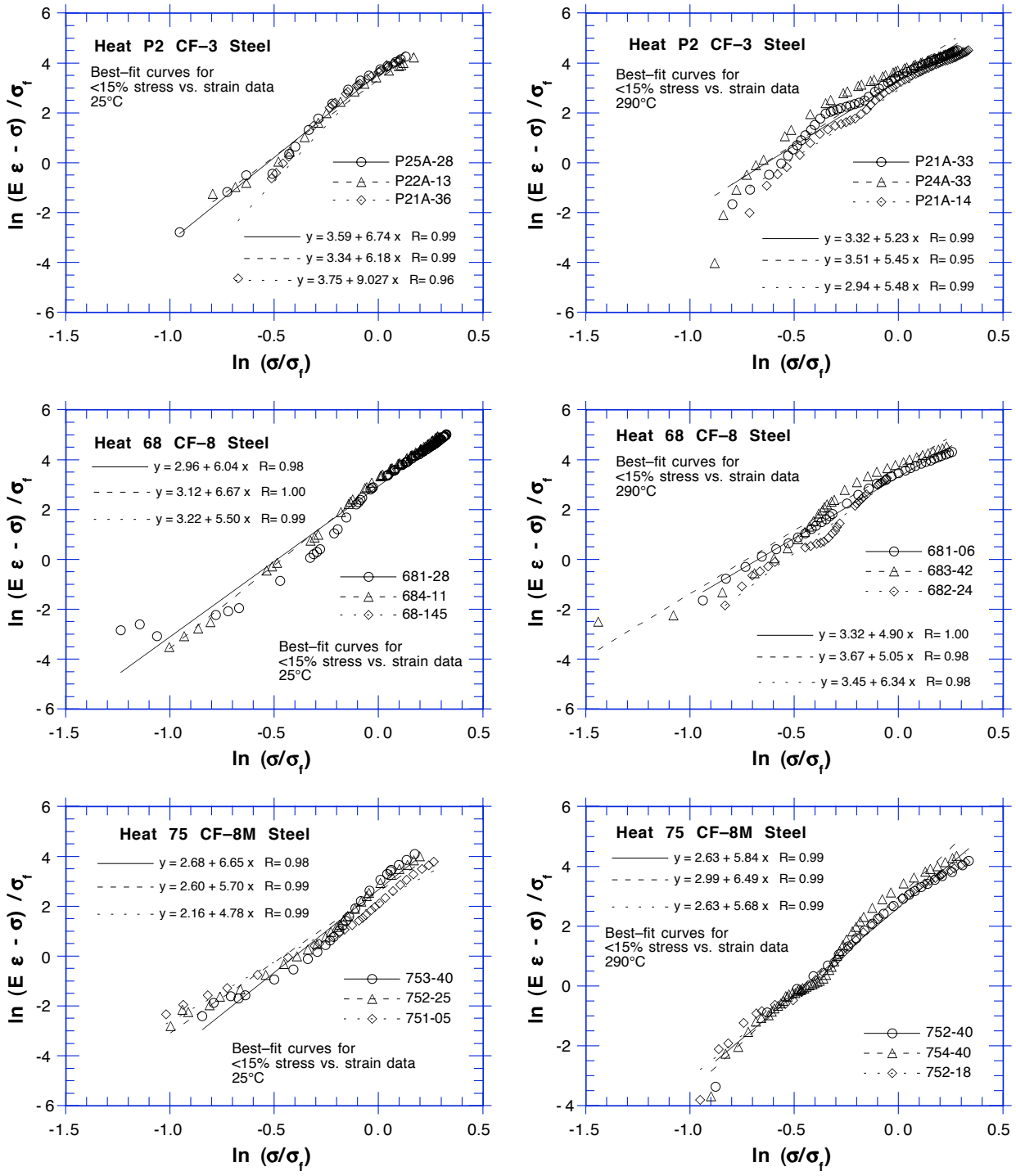


Figure 20. (Contd.)

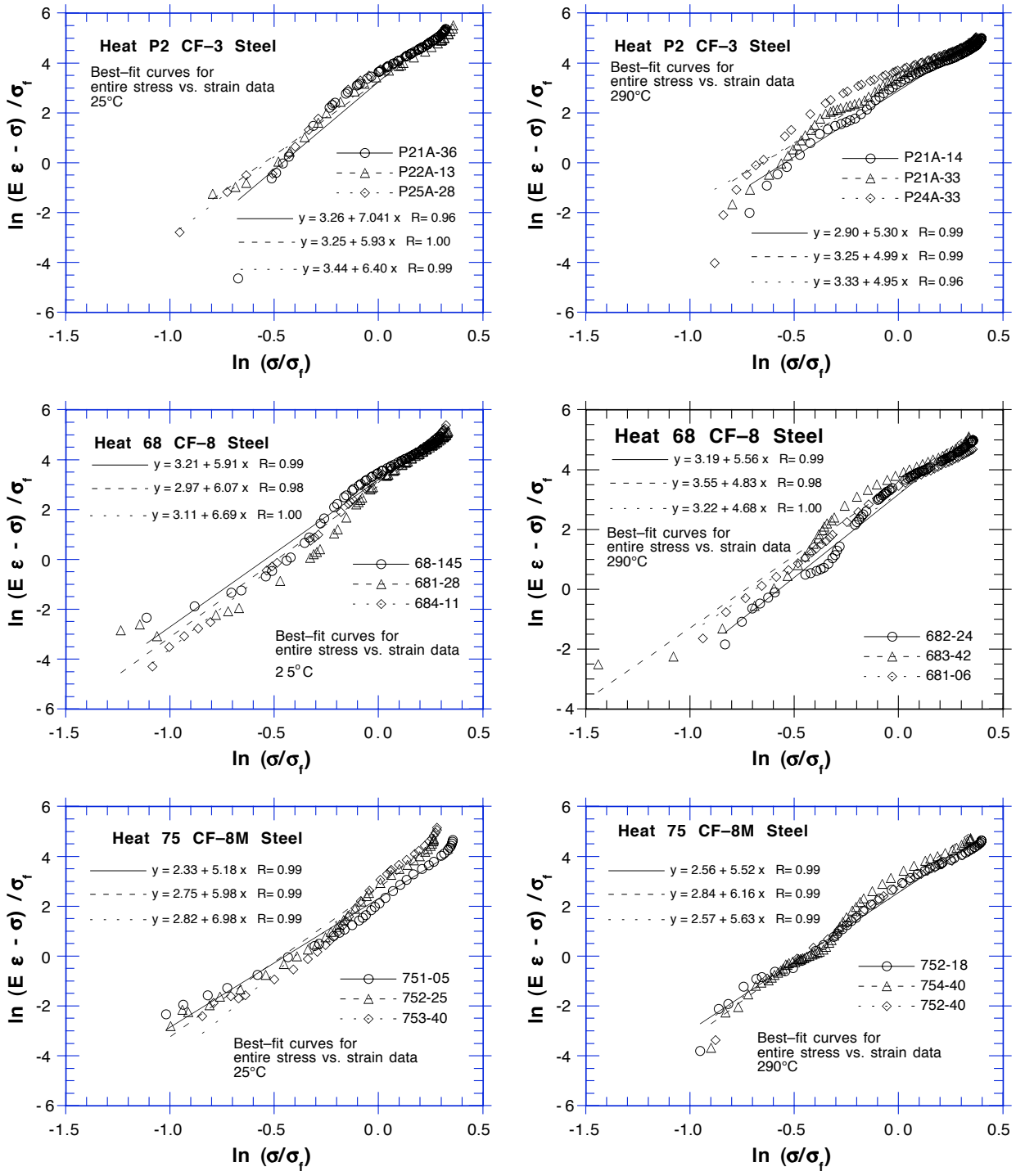


Figure 20. (Contd.)

Table 4. Best–fit values of the Ramberg–Osgood constants for unaged and aged cast stainless steels at room temperature

Specimen Id	Aging Temp. (°C)	Aging Time (h)	Flow Stress (MPa)	Yield Stress (MPa)	Stress–Strain Data <5% Strain				Stress–Strain Data <15% Strain			
					Flow Stress Reference		Yield Stress Reference		Flow Stress Reference		Yield Stress Reference	
					α_1	n_1	α_2	n_2	α_1	n_1	α_2	n_2
I1V–01	–	Unaged	–	–	–	–	–	–	–	–	–	–
I1V–02	–	Unaged	–	–	–	–	–	–	–	–	–	–
I2V–01	–	Unaged	–	–	–	–	–	–	–	–	–	–
I2V–02	–	Unaged	–	–	–	–	–	–	–	–	–	–
I3C–01	–	Unaged	–	–	–	–	–	–	–	–	–	–
I2V–23	320	30000	–	–	–	–	–	–	–	–	–	–
I3C–14	320	30000	–	–	–	–	–	–	–	–	–	–
I3V–38	320	30000	–	–	–	–	–	–	–	–	–	–
I3V–39	320	30000	–	–	–	–	–	–	–	–	–	–
I1V–26	350	10000	–	–	–	–	–	–	–	–	–	–
I1V–27	350	10000	–	–	–	–	–	–	–	–	–	–
I2V–19	350	10000	–	–	–	–	–	–	–	–	–	–
P21T–01		Unaged	383.9	216.3	159.990	9.444	1.260	9.457	159.990	9.444	1.260	9.457
P23T–01		Unaged	383.9	238.1	40.424	5.683	4.337	5.741	85.369	7.176	4.585	7.167
P22A–01		Unaged	383.9	206.4	–	–	–	–	–	–	–	–
P23A–01		Unaged	383.9	216.7	215.760	9.724	1.487	9.574	215.760	9.724	1.487	9.574
P22T–16	290	30000	402.2	247.0	32.593	7.114	1.668	7.139	25.473	6.437	1.835	6.402
P21A–31	290	30000	402.2	242.6	22.849	4.613	3.701	4.645	33.167	5.341	3.778	5.307
P25A–28	290	30000	402.2	223.9	51.289	7.584	1.087	7.616	36.499	6.778	1.222	6.799
P21A–36	290	58000	423.7	263.6	72.661	9.374	1.365	9.374	37.263	7.274	1.897	7.274
P24T–14	320	30000	420.6	229.4	40.476	6.737	1.312	6.718	33.034	6.226	1.457	6.200
P25T–10	320	30000	420.6	258.1	35.647	5.582	3.913	5.640	33.573	5.429	4.028	5.396
P22A–36	320	30000	420.6	237.4	33.190	7.072	1.079	7.058	27.017	6.515	1.209	6.486
P21A–19	320	55000	420.6	249.7	38.413	7.061	1.630	7.061	26.214	5.977	1.956	5.977
P22T–04	350	10000	428.6	252.3	54.343	7.512	1.725	7.583	37.351	6.682	1.863	6.661
P23A–14	350	10000	428.6	249.2	–	–	–	–	–	–	–	–
P23A–26	350	10000	428.6	265.2	25.764	5.133	3.614	5.236	34.435	5.571	3.835	5.609
P22T–11	350	30000	430.2	249.3	26.955	5.275	2.633	5.282	27.933	5.291	2.809	5.217
P22A–13	350	30000	430.2	245.5	36.711	6.805	1.435	6.797	28.308	6.128	1.559	6.167
P24A–32	350	30000	430.2	225.4	39.929	6.309	1.291	6.309	37.118	6.148	1.332	6.148
P24T–05	400	10000	422.4	233.5	24.690	4.656	2.851	4.697	28.145	4.865	2.897	4.842
P24A–04	400	10000	422.4	236.2	28.971	4.915	3.007	4.955	29.521	4.936	3.059	4.912
693–40	–	Unaged	435.5	278.8	–	–	–	–	–	–	–	–
693–41	–	Unaged	435.5	273.4	–	–	–	–	–	–	–	–
694–30	290	30000	424.1	253.6	30.555	4.728	4.698	4.745	43.951	6.190	3.200	6.213
694–31	290	30000	424.1	264.1	24.789	5.776	2.512	5.776	27.213	5.920	2.574	5.920
69–135	290	30000	424.1	244.7	22.763	4.376	3.694	4.399	30.069	5.419	2.759	5.441
694–21	320	10000	432.2	286.7	17.925	4.851	3.713	4.869	20.988	5.264	3.717	5.224
694–25	320	10000	432.2	232.1	44.791	6.399	1.567	6.418	44.623	6.370	1.620	6.334
692–40	320	30000	424.0	289.6	15.853	5.845	2.512	5.846	15.988	5.837	2.555	5.820
692–41	320	30000	424.0	269.4	18.531	7.844	0.823	7.864	14.921	6.909	0.978	6.996
69–245	320	30000	424.0	272.5	26.978	6.855	2.047	6.829	24.139	6.386	2.204	6.411
691–28	320	50000	472.7	291.6	22.045	6.877	1.289	6.877	20.545	6.661	1.334	6.661
691–29	320	50000	472.7	287.7	21.561	6.549	1.371	6.549	20.691	6.421	1.402	6.421
69–230	320	50000	472.7	298.8	13.510	4.912	2.261	4.939	17.249	5.845	1.865	5.883
692–25	350	2570	467.4	285.4	15.553	4.340	3.026	4.367	26.148	5.012	3.654	5.006
692–26	350	2570	467.4	302.6	26.449	7.724	1.421	7.724	23.675	7.446	1.436	7.446
694–06	350	10000	447.4	292.1	17.587	5.489	2.633	5.467	19.035	5.746	2.601	5.673
694–07	350	10000	447.4	266.2	21.273	5.627	1.929	5.642	21.923	5.677	1.968	5.649
694–08	350	10000	447.4	246.8	35.089	5.691	2.174	5.710	43.789	6.389	1.783	6.394
69–119	350	10000	447.4	249.6	23.819	5.233	2.042	5.221	25.712	5.393	2.048	5.341
693–12	350	30000	463.1	270.9	10.841	3.606	2.693	3.631	14.585	4.623	2.089	4.646
693–13	350	30000	463.1	259.2	0.221	6.764	0.008	6.801	0.310	5.892	0.017	5.950
69–130	350	30000	463.1	258.4	0.170	6.811	0.006	6.809	0.229	6.114	0.011	6.180
692–16	400	2570	469.1	253.6	19.126	4.302	2.529	4.359	27.997	4.819	2.745	4.781
692–17	400	2570	469.1	300.9	13.736	5.709	1.706	5.727	14.780	5.816	1.769	5.790
692–15	400	10000	478.7	287.8	19.665	4.433	3.448	4.433	22.398	4.730	3.412	4.698
692–22	400	10000	478.7	278.6	14.768	3.925	3.078	3.906	18.461	4.490	2.867	4.447

Table 4. (Contd.)

Specimen Id	Aging Temp. (°C)	Aging Time (h)	Flow Stress (MPa)	Yield Stress (MPa)	Stress–Strain Data <5% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2	Stress–Strain Data <15% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2
692–23	400	10000	478.7	260.5	0.052	9.372	0.000	9.364	0.101	7.372	0.002	7.372
69–109	400	10000	478.7	276.7	15.407	3.777	3.422	3.763	20.840	4.475	3.211	4.422
691–04	450	2570	472.7	271.3	16.603	5.109	1.713	5.120	17.980	5.230	1.749	5.202
691–05	450	2570	472.7	263.1	15.329	4.617	1.833	4.676	21.304	5.129	1.938	5.094
13–12	Reannealed		428.0	317.3	11.427	5.877	2.680	5.931	19.503	7.339	2.968	7.326
13–21	Reannealed		428.0	289.2	14.418	6.371	1.775	6.388	16.916	6.855	1.739	6.805
13–22	Reannealed		428.0	287.7	21.342	6.146	2.787	6.179	29.837	6.952	2.854	6.923
18–11	280	68000	427.7	306.2	10.625	5.530	2.348	5.566	19.999	7.231	2.517	7.239
18–12	280	68000	427.7	288.5	10.993	4.205	3.137	4.219	18.607	5.475	3.254	5.445
18–22	280	68000	427.7	291.9	14.229	4.033	4.495	4.065	22.943	5.087	4.860	5.087
P13T–01	–	Unaged	414.7	244.7	–	–	–	–	–	–	–	–
P13T–03	–	Unaged	414.7	245.9	18.390	4.811	2.558	4.811	–	–	–	–
P11A–01	–	Unaged	414.7	–	–	–	–	–	–	–	–	–
P13A–01	–	Unaged	414.7	248.5	13.941	3.592	3.735	3.641	13.941	3.592	3.735	3.641
P14T–09	290	30000	432.6	266.2	38.307	7.901	1.371	7.881	30.932	7.239	1.561	7.157
P11A–25	290	30000	432.6	285.7	19.437	5.851	2.637	5.982	41.052	7.222	3.163	7.197
P14A–26	290	30000	432.6	276.5	32.047	8.186	1.284	8.242	25.783	7.626	1.382	7.551
P11A–28	290	58000	406.9	263.5	54.999	7.121	3.893	7.176	119.150	10.061	2.328	10.098
P11A–29	290	58000	406.9	266.1	47.780	7.616	2.915	7.694	85.846	10.007	1.875	10.023
P11A–10	320	30000	437.5	279.1	21.692	5.411	3.020	5.462	37.846	7.781	1.801	7.808
P11T–06	320	30000	437.5	279.1	10.098	6.872	0.742	6.902	18.305	8.368	0.712	8.281
P14T–08	320	30000	437.5	279.1	28.733	6.122	2.922	6.167	30.281	6.185	3.048	6.133
P11A–13	320	55000	480.4	299.0	52.974	9.220	1.075	9.220	33.964	7.887	1.297	7.887
P12A–25	320	55000	480.4	287.6	35.501	7.301	1.233	7.301	26.832	6.632	1.366	6.632
P12T–05	350	10000	449.0	276.8	21.132	5.215	2.776	5.269	31.762	5.947	2.949	5.930
P12T–06	350	10000	449.0	263.4	–	–	–	–	–	–	–	–
P12A–08	350	10000	449.0	290.5	16.002	6.087	1.767	6.131	18.882	6.406	1.817	6.387
P12A–09	350	10000	449.0	271.2	23.598	5.539	2.416	5.571	31.778	6.061	2.504	6.049
P12T–11	350	30000	450.7	266.6	–	–	–	–	–	–	–	–
P12A–13	350	30000	450.7	285.0	–	–	–	–	–	–	–	–
P12A–14	350	30000	450.7	263.5	18.527	4.510	2.843	4.531	27.212	5.877	1.984	5.914
P13T–07	400	10000	477.3	285.0	16.824	5.017	2.132	5.108	23.356	5.687	2.064	5.733
P13A–07	400	10000	477.3	286.3	–	–	–	–	–	–	–	–
683–40	–	Unaged	400.2	274.1	18.111	6.157	2.626	6.256	35.382	7.344	3.307	7.302
683–41	–	Unaged	400.2	279.4	207.510	14.167	1.829	14.167	46.484	8.900	2.720	8.900
683–33	290	30000	401.8	263.1	42.422	5.875	5.444	5.922	97.246	9.132	3.121	9.194
684–31	290	30000	411.3	269.2	44.741	7.984	2.317	7.984	29.922	6.728	2.640	6.728
68–145	290	30000	411.3	278.0	36.767	8.380	2.042	8.380	23.922	6.864	2.406	6.864
684–21	320	10000	442.7	304.5	26.407	6.045	4.024	6.147	33.866	6.667	4.124	6.635
684–22	320	10000	442.7	281.0	29.172	6.156	2.817	6.253	45.705	7.056	2.951	7.053
682–41	320	30000	461.3	305.7	24.772	7.692	1.614	7.707	21.104	7.180	1.713	7.149
684–39	320	30000	461.3	358.2	11.773	7.925	2.091	7.942	13.833	8.705	2.041	8.664
68–264	320	30000	461.3	296.2	64.084	8.442	2.416	8.497	57.662	8.112	2.533	8.105
681–28	320	50000	458.8	326.9	21.643	8.739	1.571	8.739	18.528	8.083	1.680	8.083
681–29	320	50000	458.8	303.7	37.068	9.573	1.047	9.575	24.331	8.088	1.213	8.211
68–230	320	50000	458.8	294.3	51.050	8.868	1.534	8.905	39.151	8.325	1.438	8.395
682–25	350	5780	444.3	281.5	17.455	5.151	2.659	5.216	34.164	6.178	3.259	6.169
682–26	350	5780	444.3	294.8	19.928	6.556	2.062	6.604	25.623	6.943	2.279	6.939
684–06	350	10000	445.5	264.5	28.948	5.701	2.521	5.718	30.160	5.763	2.562	5.732
684–07	350	10000	445.5	299.7	20.265	5.926	2.907	5.940	22.413	6.206	2.912	6.158
684–08	350	10000	445.5	296.8	31.405	7.795	1.992	7.822	22.691	6.769	2.120	6.826
68–129	350	10000	445.5	287.6	28.106	6.786	2.255	6.817	30.560	6.971	2.313	6.911
684–10	350	30000	464.6	299.0	17.031	5.158	2.753	5.164	19.141	5.366	2.890	5.314
684–11	350	30000	464.6	281.1	28.202	6.988	1.392	6.988	27.810	6.920	1.420	6.920
68–139	350	30000	464.6	287.4	17.838	4.824	2.867	4.829	20.368	5.068	2.966	5.025
682–16	400	2570	467.8	294.1	12.724	4.995	2.019	5.046	23.999	5.842	2.612	5.821
682–17	400	2570	467.8	289.8	58.392	8.607	1.551	8.742	40.401	7.823	1.602	7.762
682–15	400	10000	474.8	313.4	13.800	3.938	4.105	3.938	20.428	4.786	4.345	4.743
682–22	400	10000	474.8	299.3	19.582	5.423	2.559	5.443	24.375	5.914	2.576	5.872

Table 4. (Contd.)

Specimen Id	Aging Temp. (°C)	Aging Time (h)	Flow Stress (MPa)	Yield Stress (MPa)	Stress–Strain Data <5% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2	Stress–Strain Data <15% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2
682–23	400	10000	474.8	306.0	22.124	8.130	0.980	8.155	15.832	7.263	1.077	7.150
68–119	400	10000	474.8	306.0	11.958	6.646	1.041	6.640	18.501	7.864	0.982	7.718
681–04	450	2570	471.7	291.3	12.073	4.417	2.340	4.437	19.187	5.741	1.990	5.705
681–05	450	2570	471.7	309.4	23.584	8.151	1.151	8.147	15.286	6.787	1.285	6.855
733–40	–	Unaged	397.9	254.3	43.198	5.265	6.497	5.358	65.118	5.911	7.280	5.950
733–41	–	Unaged	397.9	249.5	42.120	4.949	6.744	5.031	66.565	5.680	7.556	5.687
734–23	320	10000	361.7	221.9	82.088	5.642	8.583	5.740	136.890	7.082	7.003	7.213
734–24	320	10000	361.7	228.2	78.605	6.508	6.307	6.600	235.190	10.357	3.163	10.418
732–25	350	2570	385.8	244.0	31.340	4.668	5.909	4.741	53.655	5.476	6.962	5.489
732–26	350	2570	385.8	244.4	39.039	5.082	6.108	5.162	51.467	5.553	6.481	5.556
734–06	350	10000	369.0	228.0	37.056	4.636	6.482	4.662	50.353	5.766	5.093	5.805
734–07	350	10000	369.0	219.1	92.682	7.376	3.370	7.431	161.510	9.453	1.954	9.440
73–119	350	10000	369.0	212.8	77.572	5.914	5.223	5.979	160.750	8.181	3.088	8.212
732–16	400	2570	397.7	240.8	45.420	4.952	6.315	5.012	58.294	5.303	6.786	5.313
732–17	400	2570	397.7	252.6	30.895	4.551	6.243	4.650	53.262	5.458	7.143	5.445
732–15	400	10000	383.5	235.3	79.137	7.745	2.961	7.812	138.690	9.914	1.775	9.899
732–22	400	10000	383.5	215.8	59.208	5.429	4.664	5.478	108.370	7.384	2.776	7.397
73–109	400	10000	383.5	222.2	141.470	7.653	3.769	7.714	231.090	9.089	2.801	9.124
731–04	450	2570	388.5	256.5	26.147	2.851	12.319	2.896	51.846	3.799	16.259	3.812
731–05	450	2570	388.5	234.0	39.084	4.884	5.495	4.965	54.330	5.445	5.781	5.447
205–26	400	18000	451.7	248.5	16.608	5.582	1.083	5.572	15.368	5.245	1.187	5.277
205–27	400	18000	451.7	254.0	26.983	6.041	1.482	6.041	21.881	5.480	1.660	5.480
205–30	400	18000	451.7	248.7	18.630	5.929	1.038	5.826	17.727	5.702	1.106	5.655
743–40	–	Unaged	405.1	273.5	28.508	7.143	2.567	7.242	28.508	7.143	2.567	7.242
743–41	–	Unaged	405.1	273.0	32.577	7.243	2.790	7.338	41.016	7.732	2.907	7.733
743–36	290	30000	426.9	282.2	19.449	4.611	4.389	4.633	26.229	6.060	3.252	6.083
744–34	290	30000	426.9	292.9	17.663	4.946	4.026	4.980	24.788	6.879	2.729	6.912
74–135	290	30000	426.9	259.0	39.152	6.521	2.484	6.543	49.329	7.376	2.042	7.397
744–21	320	10000	415.0	273.1	22.149	4.989	4.217	4.983	29.442	6.601	2.857	6.585
744–25	320	10000	415.0	270.5	22.929	6.195	2.513	6.233	36.461	8.431	1.518	8.437
742–42	320	30000	464.7	312.7	27.934	7.079	2.521	7.092	26.811	6.934	2.588	6.908
744–39	320	30000	464.7	326.4	13.424	6.229	2.126	6.223	13.100	6.043	2.217	6.033
74–245	320	30000	464.7	278.8	28.997	6.733	1.558	6.727	26.061	6.360	1.715	6.329
741–28	320	50000	475.1	309.1	29.442	8.931	0.964	8.869	29.442	8.931	0.964	8.869
741–29	320	50000	475.1	304.5	32.513	8.929	0.953	8.917	32.513	8.929	0.953	8.917
74–230	320	50000	475.1	299.4	24.334	7.678	1.113	7.643	24.334	7.678	1.113	7.643
742–25	350	2570	410.5	269.0	16.928	6.393	1.742	6.435	19.907	6.785	1.753	6.755
742–26	350	2570	410.5	261.0	16.973	5.303	2.418	5.303	30.084	6.277	2.758	6.277
744–07	350	10000	440.1	281.7	14.788	4.524	3.085	4.549	21.009	6.194	2.070	6.226
744–08	350	10000	440.1	278.2	18.690	6.054	1.840	6.054	19.480	6.119	1.860	6.119
74–119	350	10000	440.1	267.5	15.903	4.226	3.211	4.245	21.691	5.414	2.418	5.439
743–13	350	30000	447.3	265.8	0.107	7.431	0.004	7.431	0.150	6.635	0.008	6.635
743–14	350	30000	447.3	260.3	0.133	7.107	0.005	7.106	0.172	6.494	0.009	6.494
74–130	350	30000	447.3	272.3	13.905	4.037	3.101	4.053	17.690	4.985	2.460	5.014
742–16	400	2570	429.6	268.6	15.782	5.485	1.932	5.490	18.142	5.828	1.918	5.786
742–17	400	2570	429.6	267.7	22.234	5.711	2.414	5.732	25.045	5.974	2.425	5.943
742–22	400	10000	442.5	269.8	24.153	5.520	2.613	5.526	26.238	6.263	1.961	6.248
742–23	400	10000	442.5	267.7	11.307	3.804	2.768	3.828	15.704	4.972	2.134	5.005
74–110	400	10000	442.5	259.2	17.082	4.036	3.367	4.065	24.402	5.308	2.440	5.349
741–04	450	2570	438.5	257.5	15.295	4.821	2.000	4.821	17.999	5.130	1.998	5.130
741–05	450	2570	438.5	259.1	13.906	4.944	1.746	4.944	17.690	5.404	1.744	5.404
753–40	–	Unaged	461.1	313.5	12.147	6.574	1.416	6.604	16.941	7.444	1.434	7.415
753–41	–	Unaged	461.1	330.5	13.029	6.095	2.403	6.128	18.803	6.940	2.622	6.921
753–30	290	30000	467.8	315.6	20.617	6.962	1.974	6.962	19.834	6.823	2.005	6.823
754–28	290	30000	467.8	321.7	8.964	4.374	2.557	4.398	12.731	5.985	1.979	6.026
75–135	290	30000	467.8	310.6	9.692	3.836	3.057	3.858	12.318	4.842	2.565	4.877
754–21	320	10000	540.5	355.9	16.380	4.536	3.772	4.544	21.684	5.353	3.588	5.313
754–25	320	10000	540.5	406.3	10.041	4.754	3.470	4.807	16.288	6.161	3.776	6.136

Table 4. (Contd.)

Specimen Id	Aging Temp. (°C)	Aging Time (h)	Flow Stress (MPa)	Yield Stress (MPa)	Stress–Strain Data <5% Strain				Stress–Strain Data <15% Strain			
					Flow Stress Reference		Yield Stress Reference		Flow Stress Reference		Yield Stress Reference	
					α_1	n_1	α_2	n_2	α_1	n_1	α_2	n_2
752–41	320	30000	536.1	357.9	11.926	5.252	2.149	5.248	14.048	5.626	2.201	5.595
754–39	320	30000	536.1	395.1	14.744	6.116	3.119	6.095	14.412	5.957	3.196	5.942
75–245	320	30000	536.1	323.1	17.781	5.545	1.797	5.527	19.716	5.861	1.715	5.828
751–28	320	50000	540.7	334.7	13.731	6.386	1.026	6.403	14.226	6.494	1.007	6.515
751–29	320	50000	540.7	352.0	11.023	7.021	0.822	7.049	10.240	6.687	0.888	6.695
75–230	320	50000	540.7	378.4	7.784	6.904	0.977	6.834	7.787	6.874	0.990	6.811
752–25	350	2570	512.4	346.5	13.535	6.380	1.650	6.380	14.776	6.639	1.627	6.639
752–26	350	2570	512.4	346.5	9.653	5.484	1.680	5.494	12.560	6.161	1.694	6.130
754–06	350	10000	534.9	332.7	10.717	4.126	2.404	4.116	14.558	4.927	2.244	4.893
754–07	350	10000	534.9	352.5	11.133	4.345	2.713	4.349	14.696	5.132	2.615	5.088
754–08	350	10000	534.9	308.6	15.351	5.636	1.157	5.640	16.361	5.792	1.156	5.761
75–119	350	10000	534.9	354.0	10.874	2.987	4.750	2.983	16.013	3.991	4.666	3.953
753–10	350	30000	531.1	316.1	8.290	4.609	1.275	4.609	9.648	5.005	1.208	5.005
753–11	350	30000	531.1	344.3	7.949	4.105	2.147	4.102	10.552	4.779	2.188	4.737
75–130	350	30000	531.1	300.8	29.721	6.819	1.200	6.840	19.201	5.492	1.541	5.581
752–16	400	2570	528.7	326.7	12.535	5.422	1.501	5.428	14.879	5.862	1.461	5.823
752–17	400	2570	528.7	353.1	9.051	5.123	1.723	5.125	10.847	5.620	1.707	5.587
752–15	400	10000	557.6	405.3	7.764	3.164	3.893	3.164	11.286	3.990	4.348	3.990
752–22	400	10000	557.6	367.7	3.568	3.125	1.473	3.125	7.472	5.128	1.340	5.128
752–23	400	10000	557.6	338.9	11.999	5.662	1.178	5.662	12.404	5.745	1.168	5.745
75–109	400	10000	557.6	359.0	16.151	3.879	4.547	3.879	19.749	4.616	4.018	4.616
751–04	450	2570	523.5	311.7	8.651	4.794	1.233	4.763	10.631	5.384	1.134	5.331
751–05	450	2570	523.5	314.7	7.661	4.949	1.027	4.949	8.863	5.447	0.922	5.447

Table 5. Best–fit values of the Ramberg–Osgood constants for unaged and aged cast stainless steels at 290°C

Specimen Id	Aging Temp. (°C)	Aging Time (h)	Flow Stress (MPa)	Yield Stress (MPa)	Stress–Strain Data <5% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2	Stress–Strain Data <15% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2
I2V–03	–	Unaged	–	–	–	–	–	–	–	–	–	–
I2V–06	–	Unaged	–	–	–	–	–	–	–	–	–	–
I3C–02	–	Unaged	–	–	–	–	–	–	–	–	–	–
I2V–24	320	30000	–	–	–	–	–	–	–	–	–	–
I3C–15	320	30000	–	–	–	–	–	–	–	–	–	–
I3V–40	320	30000	–	–	–	–	–	–	–	–	–	–
I1V–28	350	10000	–	–	–	–	–	–	–	–	–	–
I1V–29	350	10000	–	–	–	–	–	–	–	–	–	–
I2V–20	350	10000	–	–	–	–	–	–	–	–	–	–
P21T–02	–	Unaged	273.3	161.3	30.130	3.599	7.750	3.602	40.384	4.108	8.083	4.076
P23T–02	–	Unaged	273.3	154.2	9.867	2.779	3.629	2.833	9.867	2.779	3.629	2.833
P22A–02	–	Unaged	273.3	137.9	28.481	2.892	7.894	2.928	28.481	2.892	7.894	2.928
P23A–02	–	Unaged	273.3	144.0	–	–	–	–	–	–	–	–
P21A–32	290	30000	280.3	162.3	133.790	8.911	1.745	8.902	62.867	6.959	2.255	7.108
P21A–33	290	30000	280.3	155.2	40.329	6.136	1.901	6.160	27.515	4.876	2.619	4.966
P24T–16	290	30000	280.3	148.2	593.540	9.612	2.439	9.593	119.110	6.359	3.760	6.417
P21A–37	290	58000	293.8	164.2	114.150	8.300	1.630	8.300	35.770	5.800	2.202	5.800
P22T–17	290	58000	293.8	177.5	14.069	3.600	3.860	3.600	25.090	4.000	5.470	4.000
P21A–14	320	30000	288.2	153.2	25.048	6.266	0.867	6.336	19.474	5.115	1.290	5.262
P21A–15	320	30000	288.2	163.9	62.046	7.180	1.864	7.194	40.888	6.076	2.211	6.174
P21A–16	320	30000	288.2	152.6	32.615	5.864	1.451	5.895	23.481	4.847	1.871	4.956
P25T–12	320	55000	293.7	171.4	100.920	9.045	1.283	9.057	55.847	7.457	1.572	7.652
P21A–18	320	55000	293.7	168.6	62.313	7.568	1.589	7.590	44.166	6.695	1.782	6.786
P21T–08	350	10000	285.2	155.6	74.163	6.743	2.271	6.737	32.202	4.799	3.100	4.860
P22T–05	350	10000	285.2	153.8	45.695	4.933	4.095	4.955	35.083	4.366	4.567	4.311
P23A–15	350	10000	285.2	161.0	30.569	2.874	10.639	2.927	30.569	2.874	10.639	2.927
P23A–27	350	10000	285.2	154.1	37.588	4.893	3.464	4.905	29.679	4.349	3.930	4.290
P22T–12	350	30000	292.1	167.0	21.989	6.231	1.165	6.258	17.282	5.227	1.529	5.313
P24A–30	350	30000	292.1	142.4	42.270	6.000	1.160	6.000	28.880	5.100	1.550	5.100
P24A–33	350	30000	292.1	149.1	129.200	7.900	1.210	7.900	33.430	5.400	1.680	5.400
P24T–06	400	10000	296.2	160.4	34.062	5.237	2.550	5.237	24.125	4.335	2.995	4.392
P24A–05	400	10000	296.2	146.6	58.077	5.333	2.742	5.335	34.889	4.173	3.602	4.228
693–42	–	Unaged	301.4	190.8	64.420	8.800	1.850	8.800	26.940	6.600	2.045	6.600
694–40	–	Unaged	301.4	177.0	36.631	5.468	3.337	5.588	31.210	5.066	3.738	4.998
694–32	290	30000	295.5	176.8	67.208	7.773	2.108	7.783	46.935	6.781	2.302	6.868
694–33	290	30000	295.5	173.0	57.898	7.371	1.869	7.409	41.700	6.490	2.115	6.575
69–236	290	30000	295.5	194.1	28.885	6.811	2.609	6.756	29.038	7.918	1.499	8.056
694–26	320	10000	297.4	174.4	23.782	6.627	1.177	6.631	18.479	5.606	1.464	5.722
694–27	320	10000	297.4	183.5	17.580	6.625	1.192	6.574	14.487	5.633	1.453	5.730
692–42	320	30000	295.4	178.5	22.021	6.693	1.235	6.719	15.351	5.404	1.590	5.476
694–39	320	30000	295.4	168.2	31.424	6.043	1.830	6.043	21.323	4.957	2.224	5.004
69–246	320	30000	295.4	165.5	31.758	6.747	1.121	6.774	21.168	5.392	1.580	5.467
692–28	320	55000	336.8	209.1	39.539	8.602	1.019	8.653	19.246	5.899	1.681	6.069
692–29	320	55000	336.8	212.3	28.152	7.328	1.495	7.350	18.314	5.679	1.975	5.795
69–130	320	55000	336.8	204.7	26.381	6.390	1.998	6.414	19.024	5.279	2.354	5.359
692–27	350	2570	312.2	173.1	28.175	5.109	2.513	5.115	22.891	4.661	2.716	4.622
694–09	350	10000	294.8	156.4	27.831	6.155	1.047	6.175	23.302	5.524	1.237	5.618
69–120	350	10000	294.8	179.8	16.671	5.960	1.444	5.954	14.764	5.268	1.697	5.343
693–14	350	30000	323.3	186.4	–	–	–	–	–	–	–	–
693–15	350	30000	323.3	195.8	87.807	9.618	1.147	9.608	27.180	5.664	2.344	5.856
69–270	350	30000	323.3	193.6	18.280	4.700	2.720	4.700	19.780	4.800	2.830	4.800
692–18	400	2570	304.4	163.9	20.517	5.282	1.433	5.301	17.262	4.704	1.667	4.759
692–24	400	10000	336.6	173.3	15.209	5.798	0.644	5.764	13.451	5.224	0.772	5.289
69–110	400	10000	336.6	196.9	16.846	5.161	1.828	5.144	15.834	4.894	2.008	4.865
691–06	450	2570	326.4	177.7	–	–	–	–	–	–	–	–
692–09	450	2570	326.4	175.7	16.753	3.488	3.552	3.498	20.567	3.857	3.580	3.821
16–21		Reannealed	294.2	184.0	23.371	6.542	1.730	6.606	22.522	6.420	1.791	6.398
17–21		Reannealed	294.2	171.5	43.387	7.274	1.472	7.304	35.599	6.830	1.515	6.841

Table 5. (Contd.)

Specimen Id	Aging Temp. (°C)	Aging Time (h)	Flow Stress (MPa)	Yield Stress (MPa)	Stress–Strain Data <5% Strain				Stress–Strain Data <15% Strain			
					Flow Stress Reference		Yield Stress Reference		Flow Stress Reference		Yield Stress Reference	
					α_1	n_1	α_2	n_2	α_1	n_1	α_2	n_2
15–11	280	68000	329.0	214.0	29.798	7.548	1.787	7.613	21.419	6.753	1.817	6.742
15–12	280	68000	329.0	208.4	21.457	6.952	1.421	7.022	21.433	6.907	1.469	6.878
15–21	280	68000	329.0	199.6	22.500	6.800	1.220	6.800	21.210	6.700	1.240	6.700
15–22	280	68000	329.0	180.2	50.791	6.420	1.946	6.442	41.359	6.012	2.015	6.012
P13T–02	–	Unaged	291.7	148.5	–	–	–	–	–	–	–	–
P14T–01	–	Unaged	291.7	157.0	20.036	2.770	6.687	2.816	20.036	2.770	6.687	2.816
P11A–02	–	Unaged	291.7	159.9	130.600	7.798	2.178	7.765	64.764	6.068	2.963	6.126
P13A–02	–	Unaged	291.7	155.0	24.299	2.653	8.647	2.690	24.299	2.643	8.647	2.690
P14T–10	290	30000	287.6	166.1	83.677	7.080	3.004	7.117	75.153	7.366	2.160	7.467
P11A–26	290	30000	287.6	160.3	742.000	11.368	1.730	11.288	207.350	8.505	2.528	8.505
P14A–27	290	30000	287.6	167.8	39.270	6.400	2.180	6.400	26.540	5.200	2.770	5.200
P11A–27	290	58000	295.1	167.1	753.280	12.183	1.280	12.164	68.354	6.036	3.321	6.330
P11A–30	290	58000	295.1	179.3	232.720	11.102	1.511	11.031	118.910	9.452	1.697	9.523
P11A–09	320	30000	306.1	175.5	–	–	–	–	–	–	–	–
P12A–19	320	30000	306.1	174.8	53.610	9.400	0.476	9.400	20.100	6.700	0.824	6.700
P12A–22	320	30000	306.1	175.4	31.422	6.518	1.466	6.506	23.289	5.486	1.788	5.591
P11A–12	320	55000	321.4	188.2	377.120	11.330	1.490	11.275	242.300	10.361	1.620	10.280
P12A–26	320	55000	321.4	200.4	0.054	9.398	0.001	9.404	42.068	7.541	1.910	7.540
P12T–08	350	10000	316.3	180.2	21.398	1.649	15.041	1.649	37.036	2.324	18.183	2.280
P12A–10	350	10000	316.3	173.7	–	–	–	–	–	–	–	–
P12A–11	350	10000	316.3	180.7	39.146	5.859	2.591	5.949	27.387	5.042	2.955	4.988
P12T–12	350	30000	331.6	194.9	30.730	8.900	0.451	8.900	15.200	6.600	0.757	6.600
P14A–22	350	30000	331.6	185.3	22.602	5.908	1.334	5.861	19.391	5.348	1.499	5.390
P14A–23	350	30000	331.6	198.6	21.591	5.568	2.096	5.549	18.855	4.988	2.432	4.994
P13T–08	400	10000	329.5	167.3	22.393	4.175	2.616	4.173	21.854	4.106	2.719	4.084
P13A–08	400	10000	329.5	162.9	–	–	–	–	–	–	–	–
683–42	–	Unaged	282.2	162.7	57.263	5.759	4.194	5.807	40.128	5.162	3.907	5.220
684–40	–	Unaged	282.2	156.4	62.480	5.337	4.858	5.403	53.141	5.302	4.082	5.341
684–32	290	30000	266.4	149.5	491.100	9.472	3.677	9.472	236.650	7.794	4.673	7.794
684–33	290	30000	266.4	155.0	217.630	8.564	3.619	8.564	58.224	4.643	8.098	4.643
68–246	290	30000	266.4	170.6	56.87	7.726	2.838	7.726	28.580	4.748	5.379	4.748
684–23	320	10000	299.3	173.4	46.251	7.541	1.282	7.560	27.077	5.768	1.881	5.875
684–24	320	10000	299.3	164.4	59.073	7.845	0.966	7.847	28.686	5.800	1.492	5.922
682–40	320	30000	309.9	174.3	60.509	6.851	2.081	6.897	38.295	5.861	2.297	5.889
682–42	320	30000	309.9	176.9	69.293	7.621	1.698	7.628	38.098	6.263	1.945	6.298
68–263	320	30000	309.9	165.6	82.173	7.451	1.442	7.471	39.230	5.869	1.791	5.916
682–28	320	50000	341.6	203.3	137.850	10.900	0.830	10.900	29.530	6.600	1.590	6.600
682–29	320	50000	341.6	205.3	17.860	3.600	4.790	3.600	31.420	4.100	6.510	4.100
68–130	320	50000	341.6	201.3	125.980	9.000	1.840	9.000	45.340	6.600	2.330	6.600
682–27	350	5780	318.8	185.1	51.555	6.211	3.053	6.289	40.384	5.749	3.106	5.725
684–09	350	10000	320.2	164.3	33.154	7.169	0.592	7.030	19.014	5.249	1.101	5.269
68–130	350	10000	320.2	168.9	38.779	6.331	1.326	6.269	29.055	5.464	1.581	5.546
684–12	350	30000	328.1	216.0	114.470	12.559	0.931	12.610	18.874	7.681	0.960	8.042
684–15	350	30000	328.1	190.4	97.984	7.516	2.854	7.586	141.680	9.247	1.569	9.249
68–140	350	30000	328.1	170.2	65.242	6.344	1.935	6.337	32.437	4.625	2.714	4.765
682–18	400	2570	312.2	161.3	59.088	5.578	2.872	5.608	37.567	4.714	3.224	4.718
682–24	400	10000	332.7	176.7	31.480	6.300	1.075	6.300	27.610	6.000	1.180	6.000
68–120	400	10000	332.7	193.9	29.554	6.209	1.796	6.187	23.117	5.235	2.254	5.302
681–06	450	2570	338.0	169.7	34.810	5.400	1.700	5.400	27.530	4.900	1.870	4.900
682–09	450	2570	338.0	191.6	8.430	2.600	3.460	2.600	15.580	3.100	4.840	3.100
733–42	–	Unaged	251.1	138.9	124.230	7.000	3.530	7.000	110.930	6.800	3.500	6.800
734–40	–	Unaged	251.1	133.9	51.330	4.600	5.210	4.600	70.480	5.000	5.790	5.000
734–19	320	10000	245.2	130.4	–	–	–	–	–	–	–	–
734–22	320	10000	245.2	131.3	–	–	–	–	–	–	–	–
732–27	350	2570	419.8	139.6	–	–	–	–	–	–	–	–
734–08	350	10000	268.5	127.7	–	–	–	–	–	–	–	–
734–09	350	10000	268.5	165.0	–	–	–	–	–	–	–	–
73–120	350	10000	268.5	136.7	–	–	–	–	–	–	–	–
732–18	400	2570	–	–	–	–	–	–	–	–	–	–

Table 5. (Contd.)

Specimen Id	Aging Temp. (°C)	Aging Time (h)	Flow Stress (MPa)	Yield Stress (MPa)	Stress–Strain Data <5% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2	Stress–Strain Data <15% Strain: Flow Stress Reference α_1	n_1	Yield Stress Reference α_2	n_2
732–23	400	10000	274.9	138.5	534.550	9.356	1.740	9.282	188.970	7.213	2.626	7.225
732–24	400	10000	274.9	143.0	231.760	8.357	1.888	8.318	126.800	7.114	2.282	7.136
73–110	400	10000	274.9	139.4	116.310	7.000	2.044	7.000	87.390	6.300	2.440	6.300
731–06	450	2570	281.9	144.1	104.410	6.497	2.607	6.549	52.000	5.311	2.829	5.327
732–09	450	2570	281.9	136.2	232.370	7.535	2.001	7.566	80.969	5.958	2.157	5.965
205–25	400	18000	339.0	179.4	18.003	5.151	1.286	5.155	15.687	4.713	1.419	4.763
205–28	400	18000	339.0	177.3	21.084	5.212	1.381	5.212	17.382	4.646	1.555	4.712
205–29	400	18000	339.0	168.2	–	–	–	–	–	–	–	–
744–40		Unaged	297.9	171.8	86.188	9.360	0.861	9.291	30.450	7.111	1.023	7.154
743–42		Unaged	297.9	164.6	60.021	7.722	1.113	7.722	30.750	6.220	1.390	6.220
744–35	290	30000	304.0	193.8	190.681	8.199	7.462	8.199	60.370	4.883	10.511	4.883
744–36	290	30000	304.0	165.2	230.811	8.266	2.746	8.266	62.633	4.985	5.511	4.985
74–236	290	30000	304.0	179.9	75.777	7.258	2.842	7.258	32.967	5.001	4.041	5.001
744–26	320	10000	308.6	192.7	88.686	8.381	2.744	8.381	36.606	5.100	5.311	5.100
744–27	320	10000	308.6	181.0	228.170	9.397	2.586	9.397	59.216	5.424	5.588	5.424
742–40	320	30000	324.4	153.7	75.219	7.633	0.530	7.633	37.604	5.823	1.025	5.823
742–41	320	30000	324.4	190.3	26.614	5.765	2.110	5.765	21.063	5.072	2.343	5.115
74–246	320	30000	324.4	184.4	34.808	5.726	2.431	5.721	26.416	4.989	2.715	5.025
742–28	320	50000	353.3	203.5	37.451	5.691	2.850	5.700	32.175	5.317	3.085	5.258
742–29	320	50000	353.3	215.2	40.274	7.600	1.547	7.594	23.492	5.886	2.265	5.744
74–130	320	50000	353.3	235.4	36.297	8.371	1.876	8.349	23.087	6.896	2.267	6.755
742–27	350	2570	314.6	174.9	42.692	7.360	1.020	7.321	23.367	6.086	1.159	6.109
744–06	350	10000	328.1	185.4	85.841	7.577	2.010	7.577	40.650	5.450	3.206	5.450
744–09	350	10000	328.1	197.8	42.453	7.166	1.873	7.166	23.848	4.967	3.204	4.967
74–120	350	10000	328.1	176.6	–	–	–	–	–	–	–	–
744–18	350	30000	350.0	228.5	40.940	5.910	5.046	5.910	26.472	4.790	5.259	4.790
743–15	350	30000	350.0	180.0	58.921	6.192	1.866	6.192	32.411	4.759	2.662	4.759
74–270	350	30000	350.0	182.2	65.448	6.614	1.677	6.600	32.197	4.747	2.580	4.856
742–18	400	2570	325.7	166.2	16.677	5.443	0.827	5.459	20.211	5.959	0.711	5.977
742–15	400	10000	339.5	178.9	46.860	6.366	1.487	6.377	27.495	4.658	2.422	4.777
742–24	400	10000	339.5	184.2	52.170	6.733	1.544	6.746	42.964	6.243	1.677	6.311
74–109	400	10000	339.5	172.0	67.830	6.166	2.023	6.166	41.190	5.005	2.705	5.005
741–06	450	2570	332.1	172.0	18.336	6.049	0.638	6.089	12.885	5.196	0.760	5.279
742–09	450	2570	332.1	170.3	19.035	5.811	0.767	5.795	15.463	5.218	0.899	5.252
754–40	–	Unaged	333.5	196.8	25.078	7.034	1.040	7.034	19.523	6.425	1.116	6.425
753–42	–	Unaged	333.5	191.5	44.831	8.314	0.773	8.288	20.357	6.686	0.825	6.756
754–29	290	30000	352.9	193.3	115.040	7.768	1.964	7.814	62.860	6.575	2.218	6.567
754–30	290	30000	352.9	202.6	75.568	7.828	1.724	7.844	29.391	5.103	2.723	5.265
75–236	290	30000	352.9	211.8	43.168	6.026	3.321	6.052	41.021	6.001	3.206	6.003
754–26	320	10000	372.5	205.6	22.520	6.684	0.773	6.674	16.004	5.552	0.997	5.652
754–27	320	10000	372.5	212.2	21.898	6.555	0.995	6.486	16.625	5.537	1.208	5.639
752–40	320	30000	400.0	231.7	16.985	6.141	1.019	6.151	13.869	5.279	1.276	5.356
752–42	320	30000	400.0	268.5	16.575	5.834	2.432	5.819	13.848	4.971	2.762	5.024
75–246	320	30000	400.0	213.0	29.906	5.645	1.617	5.636	23.927	5.066	1.807	5.097
752–28	320	50000	415.0	258.9	19.436	7.167	1.033	7.214	13.178	5.627	1.404	5.716
752–29	320	50000	415.0	264.1	16.035	6.185	1.559	6.171	12.815	5.647	1.482	5.744
75–130	320	50000	415.0	239.6	27.785	6.506	1.350	6.506	19.445	5.525	1.619	5.525
752–27	350	2570	366.8	204.7	16.335	6.493	0.673	6.481	13.486	6.028	0.722	6.021
754–09	350	10000	409.9	219.8	14.071	5.518	0.856	5.493	12.665	5.075	0.982	5.098
75–120	350	10000	409.9	209.9	–	–	–	–	–	–	–	–
753–12	350	30000	419.1	264.4	15.076	6.979	0.960	6.979	10.962	5.711	1.251	5.711
754–12	350	30000	419.1	227.2	17.526	5.072	1.449	5.072	14.936	4.645	1.604	4.645
75–270	350	30000	419.1	209.0	24.102	4.891	1.608	4.891	20.895	4.573	1.739	4.573
752–18	400	2570	397.2	203.2	17.324	6.207	0.525	6.207	13.672	5.555	0.624	5.601
752–24	400	10000	409.6	208.2	10.689	5.217	0.629	5.189	10.518	5.073	0.694	5.033
75–110	400	10000	409.6	206.7	15.317	5.431	0.750	5.415	14.238	5.113	0.841	5.130
751–06	450	2570	405.2	218.7	10.515	5.089	0.840	5.045	11.424	5.293	0.798	5.268
752–09	450	2570	405.2	197.7	13.264	4.882	0.783	4.891	12.952	4.829	0.789	4.850

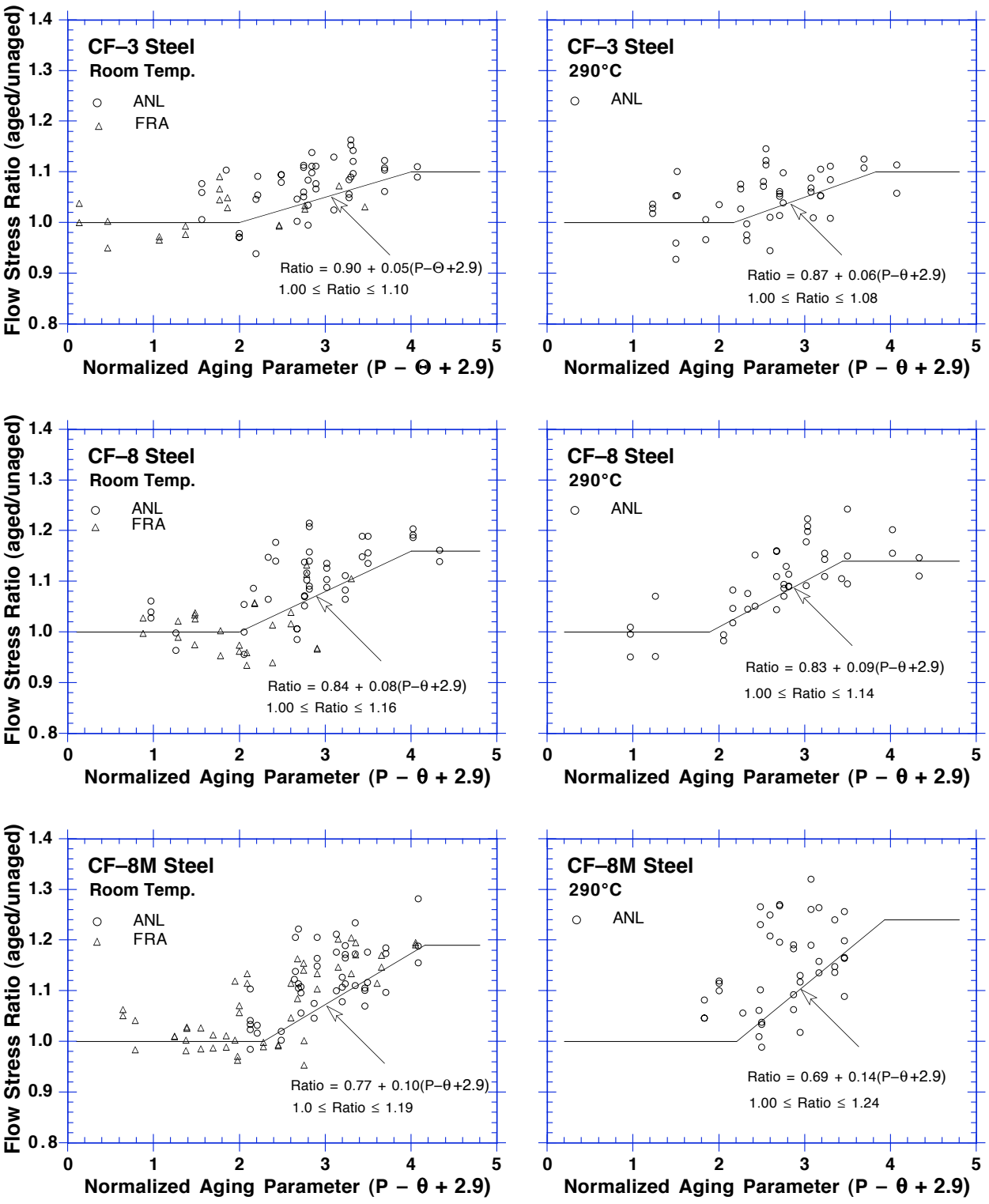


Figure 21. Flow stress ratio of aged cast stainless steels at RT and 290°C as a function of the normalized aging parameter. The solid lines represent correlations obtained by subtracting σ from the best fit curve.

Table 6. Values of constants in Eq. 8 for estimating tensile flow stress of aged cast stainless steels

Grade	Room Temp.			290°C		
	a_1	b_1	c_1	a_1	b_1	c_1
CF–3	0.90	0.05	1.10	0.87	0.06	1.08
CF–8	0.84	0.08	1.16	0.83	0.09	1.14
CF–8M	0.77	0.10	1.19	0.69	0.14	1.24

between 280 and 330°C (536 and 626°F), and ferrite content >7% for CF–8M steel and >10% for CF–3 and CF–8 steels. Thermal aging has little or no effect on the tensile strength of cast stainless steels with low ferrite content. The available data base is inadequate for estimating the tensile properties at service temperatures <280°C (<536°F).

The flow stress for a specific composition of cast stainless steel, as a function of time and temperature of aging, is estimated from Eqs. 8 and 1. The activation energy Q in Eq. 1 is determined from the composition of the steel[6,7] expressed as

$$Q = 10\left[74.52 - 7.20\theta - 3.46Si - 1.78Cr - 4.35I_1Mn + \left(148 - 125I_1\right)N - 61I_2C\right], \qquad (9)$$

where the indicators I_1 I_2 are o and 1, respectively, for CF–3 or CF–8 steels and assume the values of 1 and 0, respectively, for CF–8M steels, and θ is a constant. Parametric studies show that the aging response at reactor temperatures is relatively insensitive to the values of θ.[5,6] A θ value of 2.9 (i.e., mean value of the experimental data) is used to estimate thermal aging effects at 280–330°C (536–626°F), a value of 3.3 is used at temperatures <280°C (<536°F), and 2.5 at 330–360°C (626–680°F). Tensile flow stress of aged material can be determined from R_f and the initial tensile flow stress. The minimum value of 1 and maximum value of c_1 for the tensile–flow–stress ratio R_f is assumed, respectively, when the ratio calculated from Eq. 8 is <1 or >c_1.

Experimental and estimated tensile flow stress at 290°C (554°F) and at RT for various heats of aged cast stainless steel are shown in Fig. 22. For each heat, the aging parameter and activation energy were obtained from Eqs. 1 and 9 and a θ value of 2.9. Tensile flow stress was then estimated from Eq. 8 and the initial flow stress of the materials. The estimated values are either accurate or conservative for all materials and aging conditions.

The data on tensile properties of cast stainless steels indicate that the increase in yield stress due to thermal aging is much lower than the increase in ultimate stress. The tensile–yield–stress ratio $R_y = (\sigma_{y_{aged}}/\sigma_{y_{unaged}})$, is given by

$$R_y = a_2 + b_2P \qquad \left(1.00 \le R_y \le c_2\right). \qquad (10)$$

Values of the constants a_2, b_2, and c_2 for different grades of steel and test temperatures are given in Table 7. Equation 10 is valid for R_y values between 1 and c_2, service temperatures between 280 and 330°C (536 and 626°F), and ferrite content >7% for CF–8M steel and >10% for CF–3 and CF–8 steels.

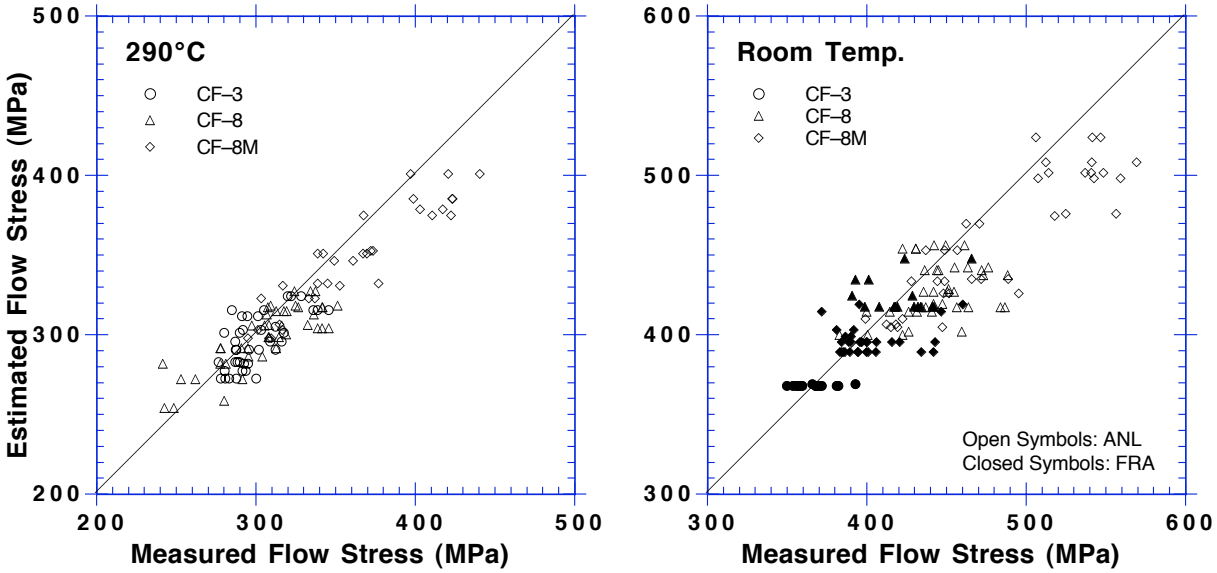


Figure 22. Experimental and estimated flow stress of aged cast stainless steel at 290°C and RT

Table 7. Values of constants in Eq. 10 for estimating tensile yield stress of aged cast stainless steels

	Room Temp.			290°C		
Grade	a_2	b_2	c_2	a_2	b_2	c_2
CF–3	0.873	0.048	1.07	0.844	0.058	1.05
CF–8	0.798	0.076	1.10	0.788	0.086	1.09
CF–8M	0.708	0.092	1.10	0.635	0.129	1.14

Experimental and estimated tensile yield stress at 290°C (554°F) and at RT for various heats of aged cast stainless steel are shown in Fig. 23. The aging parameter and activation energy were obtained from Eqs. 1 and 9 and a θ value of 2.9. Tensile yield stress was then estimated from Eq. 10 and the initial yield stress of the materials. The estimated values are conservative for most materials and aging conditions.

5.2 Ramberg–Osgood Parameters

The engineering stress vs. strain behavior of aged cast stainless steel can also be obtained from the estimated flow stress. For all grades of cast stainless steel, the RO parameter n_1 does not change with thermal aging. The parameter α_1 decreases with aging and shows good correlation with the flow stress σ_f of the material, Fig. 24. The RO parameter is correlated to flow stress σ_f by the expression

$$\alpha_1 = a_3 + b_3\sigma_f. \qquad (11)$$

The RO parameter n_1 and values of the constants a_3 and b_3 for different grades of steel, test temperatures, and range of engineering strain are given in Table 8. Examples of engineering

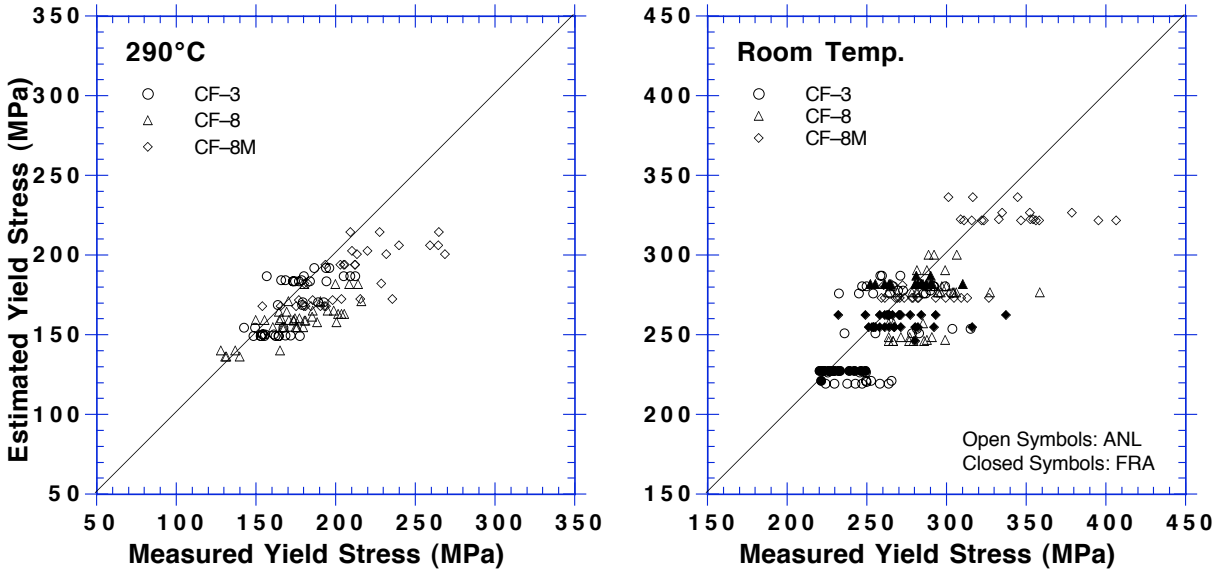


Figure 23. Experimental and estimated yield stress of aged cast stainless steel at 290°C and RT

Table 8. Values of Ramberg/Osgood parameter n_1 and the constants in Eq. 11 for estimating parameter α_1 for aged cast stainless steels

Strain		Room Temp.			290°C		
%	Grade	a_3	b_3	n_1	a_3	b_3	n_1
<5	CF–3	143.9	−0.267	6.1	102.1	−0.235	6.2
	CF–8	157.9	−0.300	6.4	153.3	−0.373	7.1
	CF–8M	50.9	−0.072	5.6	145.9	−0.314	6.6
<15	CF–3	104.5	−0.176	6.0	91.3	−0.221	5.3
	CF–8	149.0	−0.271	6.9	137.5	−0.336	5.9
	CF–8M	65.7	−0.097	6.1	103.3	−0.217	5.4
>15	CF–3	76.2	−0.116	6.0	95.5	−0.233	5.1
	CF–8	122.0	−0.216	6.2	124.2	−0.303	5.5
	CF–8M	44.6	−0.056	5.8	81.4	−0.162	5.4

stress–vs.–strain curves determined from estimated flow stress and Eq. 11 and those observed experimentally for several heats of aged CF–3, CF–8, and CF–8M steels, are shown in Fig. 25. The estimated curves are essentially conservative.

If required, the engineering stress–vs.–strain curve can also be obtained from Eq. 6, i.e., when yield stress is used as the reference stress. The RO parameter α_2 is determined from estimated values of α_1, σ_f, σ_y , and Eq. 7. The parameter n_2 is same as n_1.

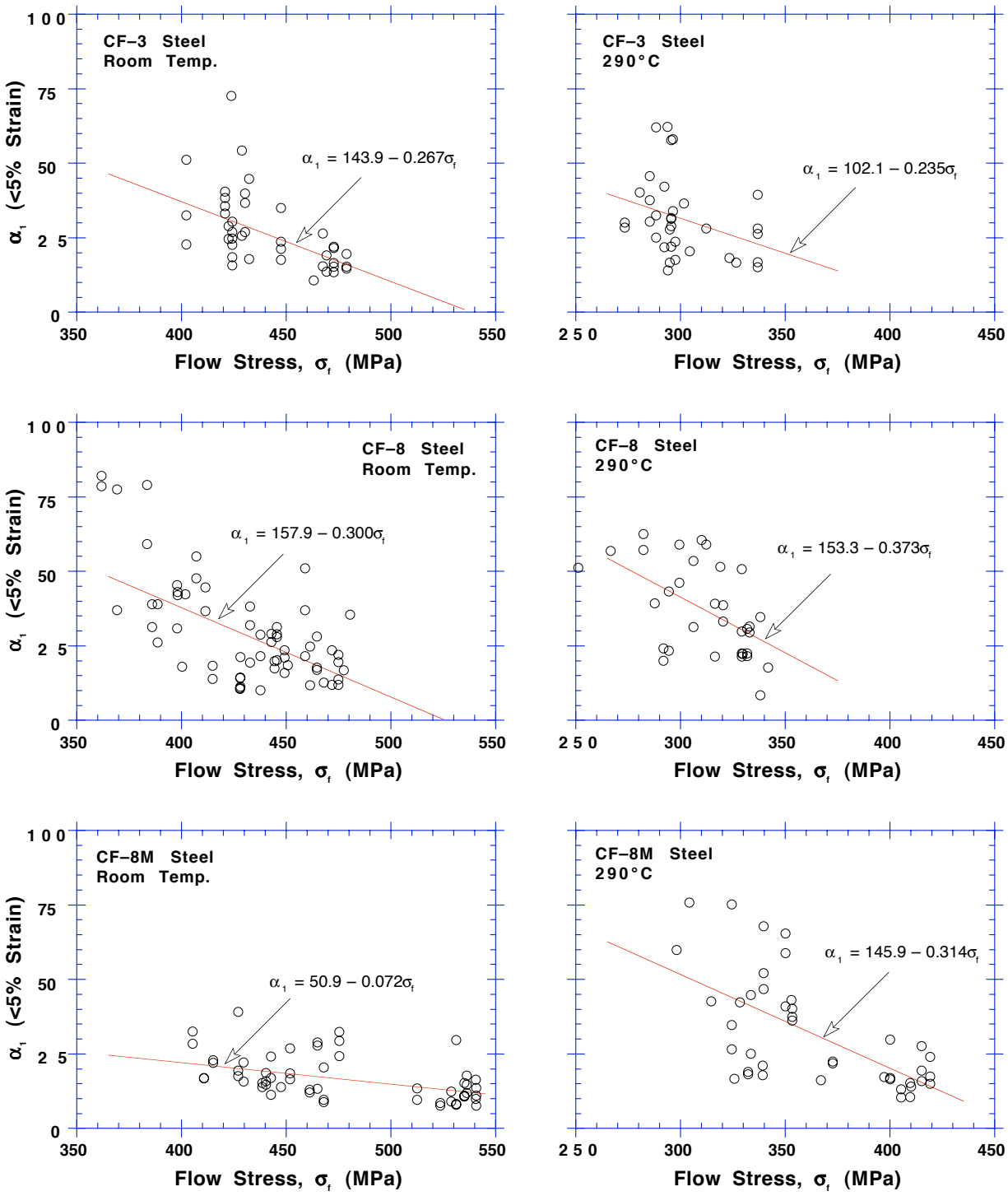


Figure 24. Correlation between the Ramberg/Osgood parameter α_1 and flow stress at RT and 290°C for cast stainless steels

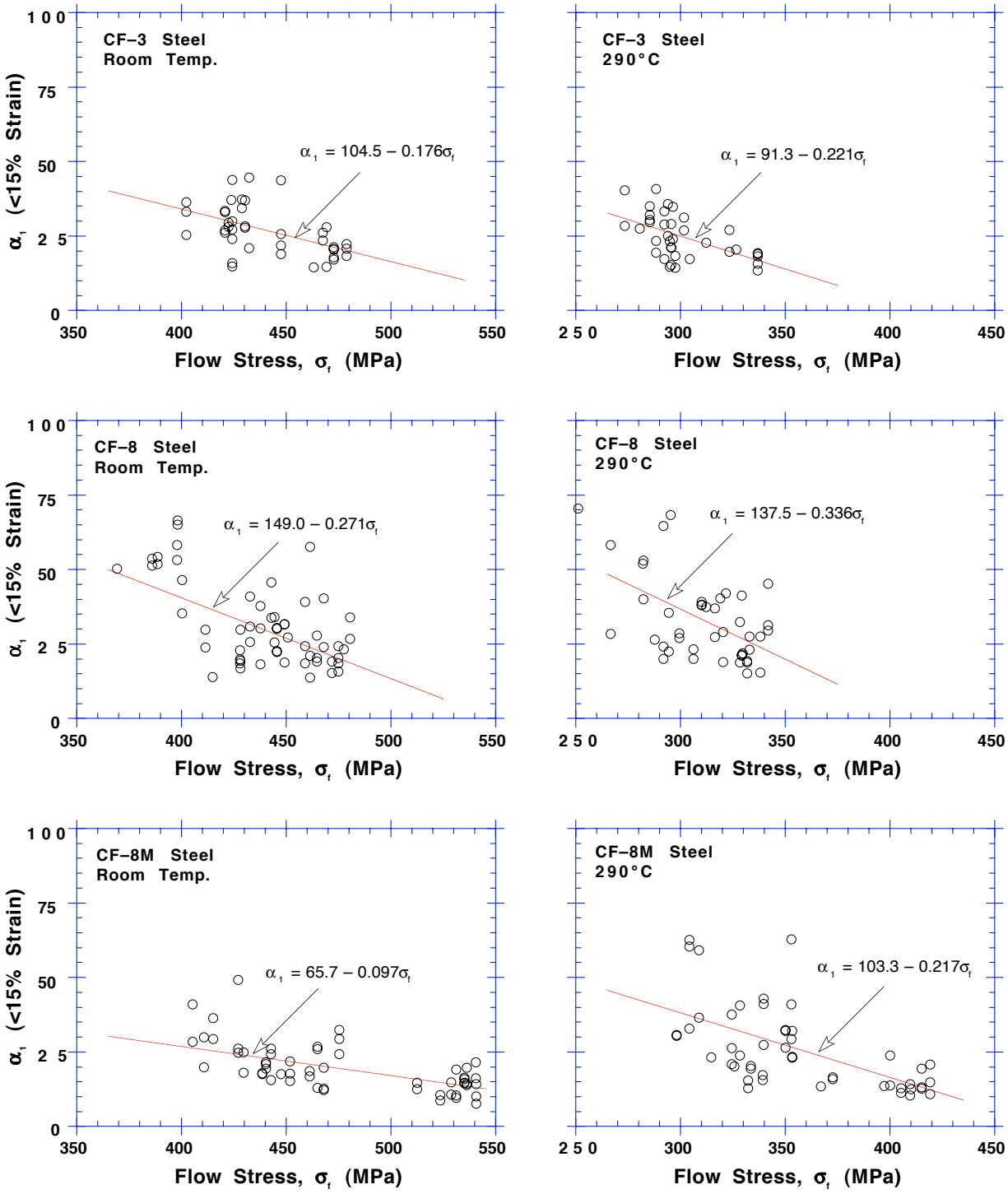


Figure 24. (Contd.)

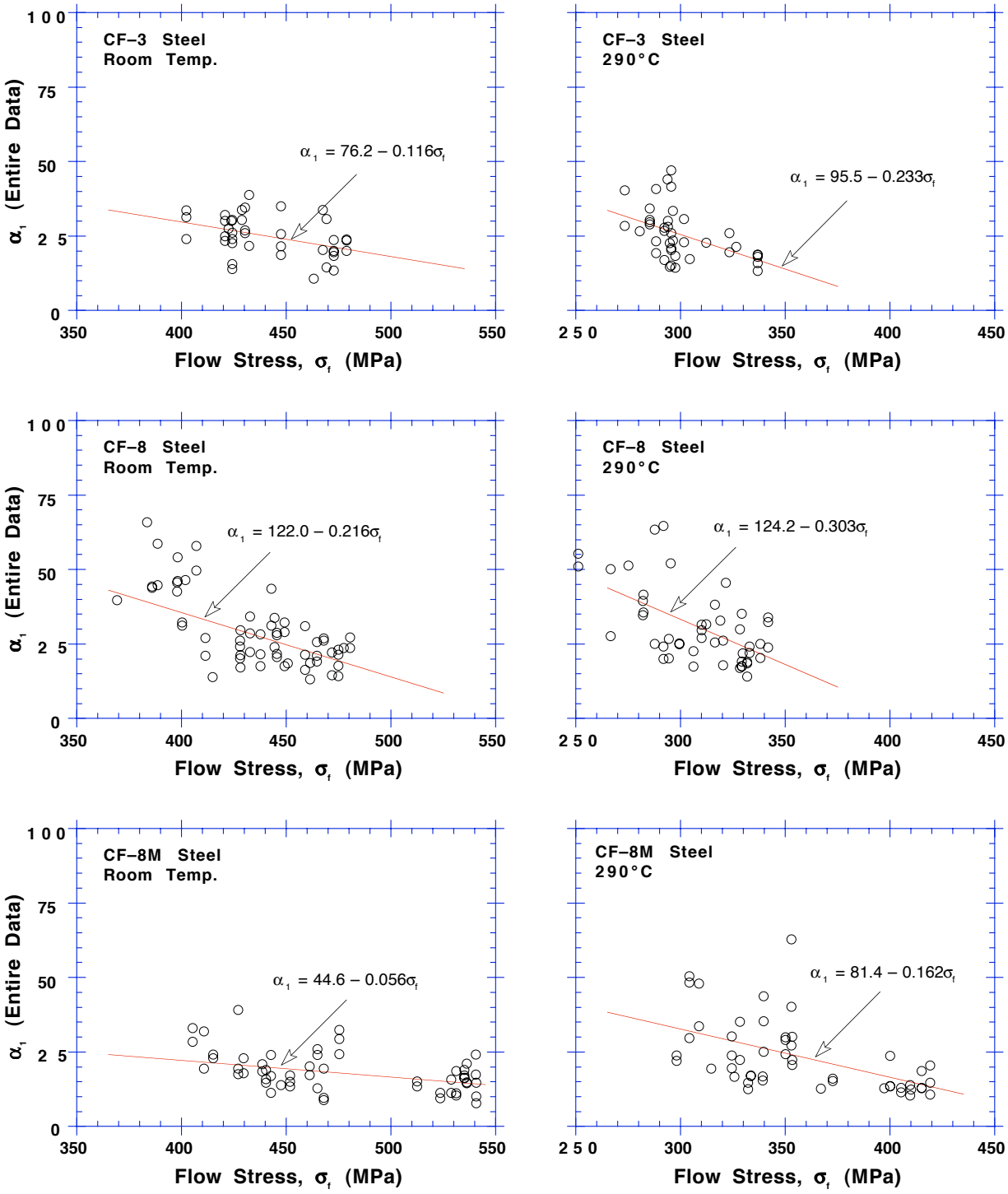


Figure 24. (Contd.)

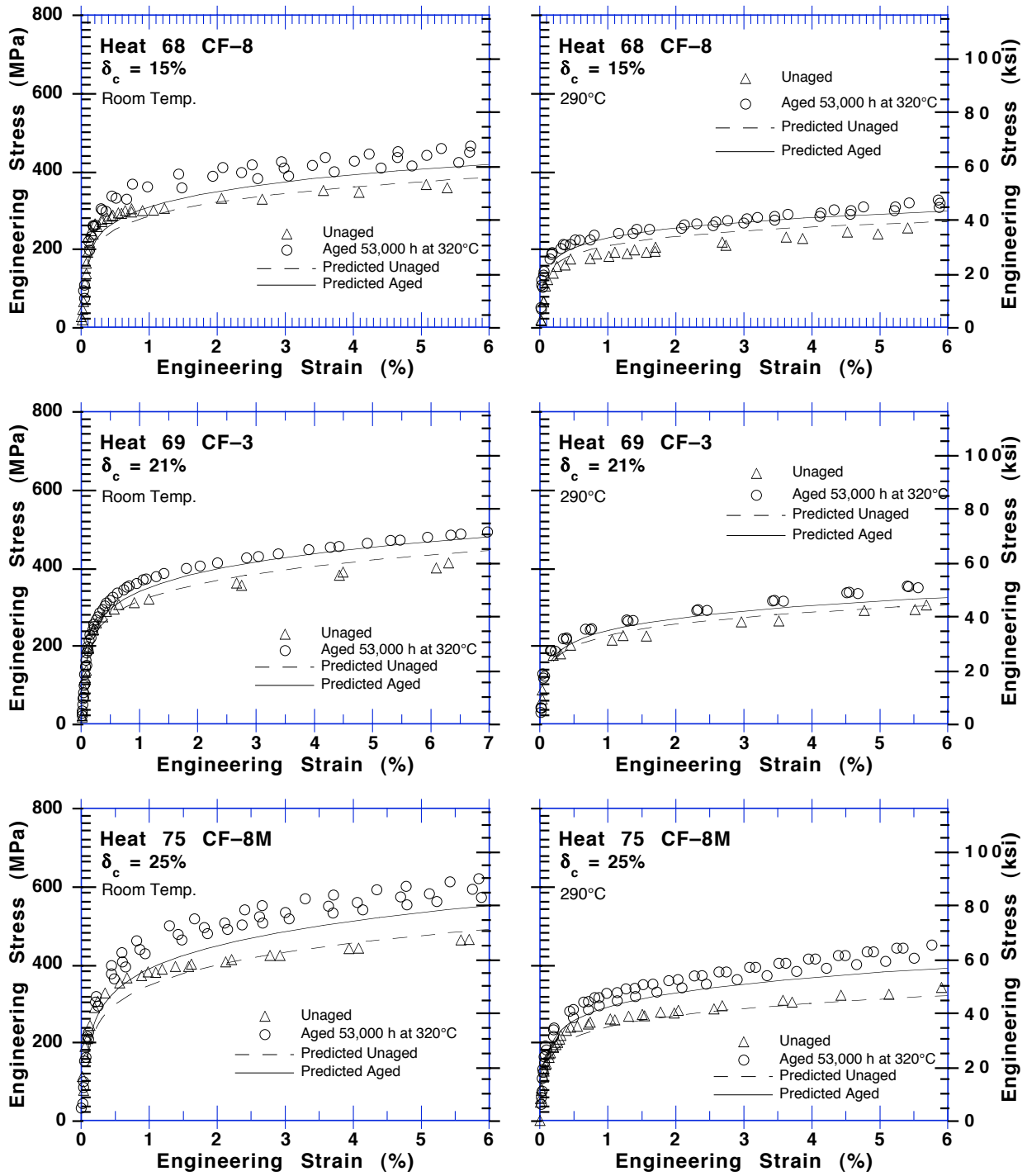


Figure 25. Engineering stress–vs.–strain curve at RT and 290°C, estimated from the chemical composition and initial tensile strength and determined experimentally for thermally aged CF–3, CF–8, and CF–8M steels

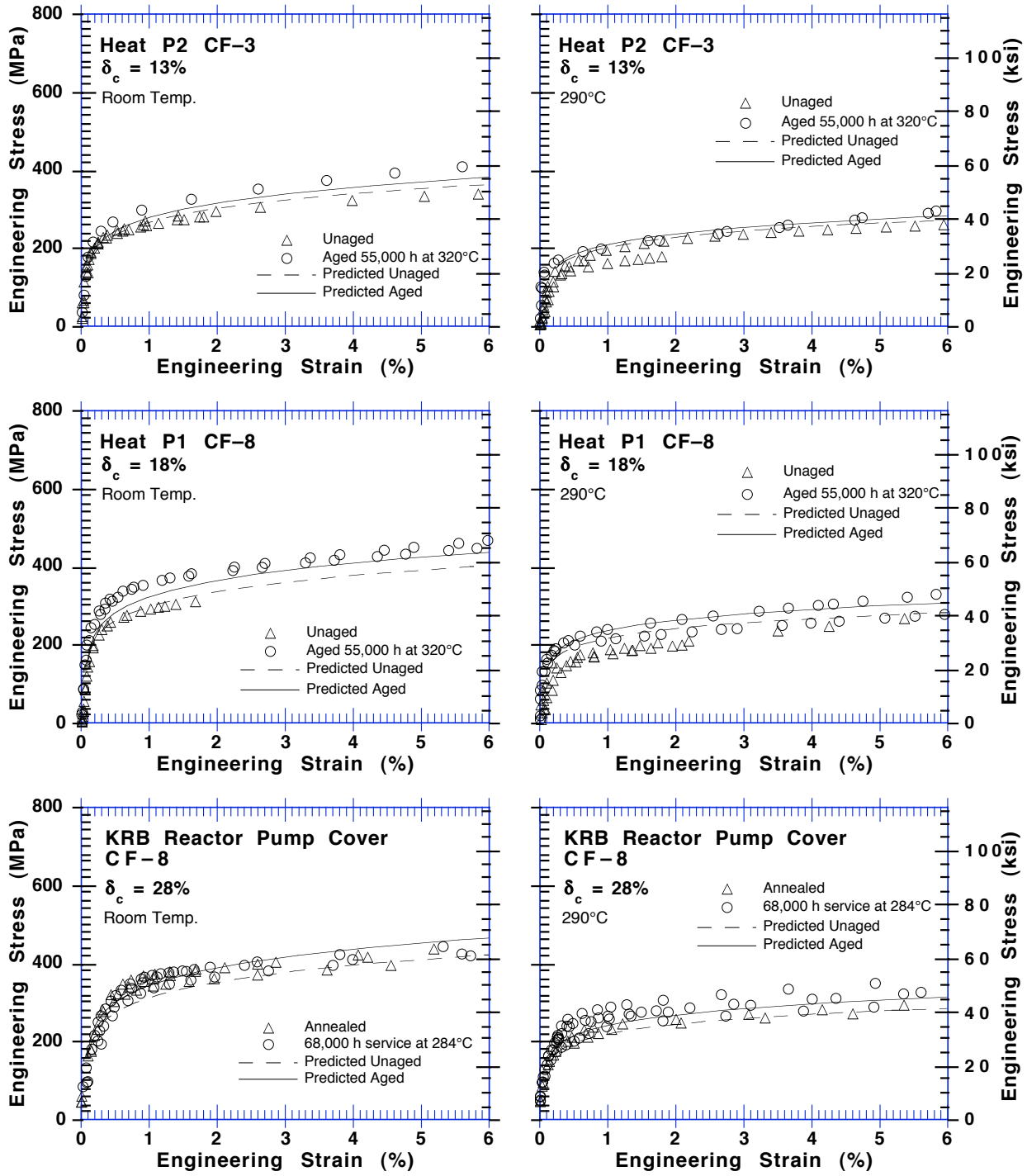


Figure 25. (Contd.)

6 Conclusions

The effect of thermal aging on tensile properties of cast stainless steels has been evaluated. Tensile data for several experimental and commercial heats of cast stainless steels are presented. The materials were thermally aged up to 58,000 h at temperatures between 290 and 450°C (554 and 842°F). Aging at these temperatures increases the tensile strength of these steels. The high–C Mo–bearing CF–8M steels are the most and the low–C Mo–free CF–3 steels least susceptible to thermal aging.

A procedure and correlations are presented for predicting the change in tensile flow and yield stress and engineering stress–vs.–strain curve (represented by the Ramberg/Osgood equation) of cast stainless steel components that is due to thermal aging during service in LWRs at 280–330°C (535–625°C). The tensile properties of aged cast stainless steel are estimated from information that is readily available from certified material test records for the component, i.e., chemical composition and the initial tensile strength of unaged material. The correlations described in this report may be used to assess thermal embrittlement of cast stainless steel components. The estimated tensile properties may be used as input to a structural analysis code, such as leak–before–break analysis of nuclear power plant piping, or for performing fitness–for–service evaluations of safety–related components in support of plant life extension and license renewal.

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Appendix

Introduction

Tensile tests were conducted according to ASTM Specification E 8 and E 21 in an Instron tensile test machine with a maximum loading capacity of 90 kN (20 kips). Cylindrical specimens with a diameter of 5.08 mm (0.2 in.) and a gauge length of 20.3 mm (0.8 in.) were used for all the tests. An axial extensometer, with an initial gauge length of 20.3 mm (0.8 in.), was used for continuous measurement of strain during room–temperature tests. An IBM computer was used to digitize load, crosshead movement, and axial displacement data, and to store the data on floppy disks. Analog traces of load–vs.–crosshead displacement and load–vs.–extensometer displacement were also obtained for each test.

The tests at 290°C (≈550°F) were conducted in a forced–air recirculating furnace. Thermocouples were mounted above and below the specimen gauge length to monitor and control the temperature within ±2°C. For the tests on samples aged for <10,000 h, an axial extensometer was not used for the elevated–temperature tests. Total strain in the specimen gauge length was determined from correlations developed from the room–temperature tests. The total elongation was determined from the crosshead displacement multiplied by 0.64. Elevated–temperature tests on the long–term–aged samples were conducted with a clip gauge mounted on the specimen grips. Total strain in the specimen gauge length was determined from correlations developed from room–temperature tests conducted with clip gauge attached to the specimen grips and the extensometer mounted on the specimen gauge length.

The engineering stress vs. strain data for ten commercial and experimental heats aged up to 58,000 h at temperatures between 290 and 450°C are presented in this appendix; results from the tests at Materials Engineering Associates (MEA) are also included.

Table 1. Test data for specimen I1V–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 264.8 MPa	Ultimate Stress	: 598.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
23.72	0.0001	298.27	0.0101	530.28	0.2536
24.20	0.0001	304.13	0.0116	539.31	0.2763
51.30	0.0002	306.47	0.0130	546.48	0.2990
87.22	0.0002	312.06	0.0144	553.99	0.3222
122.52	0.0002	314.68	0.0159	560.41	0.3454
160.44	0.0002	353.15	0.0365	566.82	0.3691
194.02	0.0003	384.38	0.0579	572.54	0.3930
222.29	0.0007	410.44	0.0792	575.99	0.4172
242.63	0.0015	433.82	0.1006	581.64	0.4418
255.86	0.0024	452.09	0.1221	585.64	0.4668
268.07	0.0035	469.46	0.1436	588.54	0.4922
277.93	0.0047	485.12	0.1652	592.12	0.5182
283.51	0.0060	497.25	0.1870	593.91	0.5451
289.37	0.0073	509.52	0.2090	596.12	0.5730
296.34	0.0088	520.76	0.2311	597.29	0.6027

Table 2. Test data for specimen I1V–02

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 242.1 MPa	Ultimate Stress	: 583.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.75	0.0000	302.20	0.0146	525.79	0.2703
69.09	0.0004	305.44	0.0160	534.34	0.2921
105.42	0.0006	309.44	0.0175	541.38	0.3142
145.82	0.0009	311.44	0.0189	546.75	0.3362
179.06	0.0013	349.01	0.0390	554.55	0.3589
207.67	0.0019	377.56	0.0599	558.41	0.3816
228.22	0.0027	403.48	0.0808	562.41	0.4049
245.52	0.0037	423.48	0.1015	566.34	0.4286
258.21	0.0049	442.02	0.1225	570.13	0.4526
269.31	0.0062	459.12	0.1434	572.95	0.4771
276.41	0.0075	472.84	0.1642	576.06	0.5021
282.41	0.0088	486.22	0.1852	578.19	0.5278
288.27	0.0102	496.63	0.2062	579.99	0.5544
293.10	0.0117	507.73	0.2273	581.09	0.5820
297.23	0.0131	517.59	0.2488	582.19	0.6116

Table 3. Test data for specimen I2V–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Y	1.0 MPa	Ultimate Stress	: 579.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.75	0.0001	303.92	0.0151	519.66	0.2644
78.26	0.0004	307.99	0.0166	527.52	0.2855
117.07	0.0006	309.92	0.0180	534.76	0.3068
158.23	0.0009	313.50	0.0195	540.62	0.3283
192.36	0.0012	347.91	0.0396	544.41	0.3501
220.15	0.0018	375.21	0.0604	550.82	0.3723
239.80	0.0027	399.00	0.0808	557.37	0.3946
254.42	0.0037	419.13	0.1011	560.47	0.4175
266.07	0.0050	436.85	0.1214	563.99	0.4406
274.20	0.0063	452.50	0.1417	567.99	0.4643
282.20	0.0077	466.84	0.1620	570.47	0.4882
287.72	0.0091	479.88	0.1822	573.64	0.5129
292.54	0.0106	490.63	0.2026	575.30	0.5384
297.58	0.0121	502.01	0.2230	577.64	0.5650
300.75	0.0136	510.69	0.2436	579.09	0.5934

Table 4. Test data for specimen I2V–02

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 257.7 MPa	Ultimate Stress	: 578.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.65	0.0001	307.71	0.0150	519.73	0.2586
65.84	0.0004	311.30	0.0165	526.76	0.2789
103.63	0.0006	313.71	0.0181	534.69	0.2992
142.51	0.0008	316.88	0.0196	539.86	0.3199
178.64	0.0010	350.12	0.0394	546.27	0.3409
212.08	0.0015	377.14	0.0600	551.10	0.3620
236.83	0.0022	401.48	0.0802	555.92	0.3835
254.76	0.0033	421.27	0.1003	560.75	0.4054
267.52	0.0044	438.02	0.1203	563.51	0.4276
276.96	0.0058	452.99	0.1400	567.37	0.4502
284.06	0.0073	465.40	0.1597	568.96	0.4732
289.30	0.0088	481.53	0.1793	572.33	0.4969
294.96	0.0104	492.35	0.1990	573.85	0.5212
299.65	0.0119	501.11	0.2188	574.75	0.5463
301.09	0.0134	511.66	0.2387	575.09	0.5735

Table 5. Test data for specimen I3C–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 239.7 MPa	Ultimate Stress	: 517.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.79	0.0001	292.20	0.0149	462.57	0.2234
70.46	0.0004	294.68	0.0164	468.64	0.2410
109.97	0.0006	298.41	0.0180	475.60	0.2589
148.44	0.0008	300.89	0.0195	480.22	0.2768
182.71	0.0012	327.23	0.0356	486.56	0.2951
209.53	0.0018	347.01	0.0525	491.73	0.3135
229.11	0.0026	365.49	0.0692	495.87	0.3323
244.42	0.0037	381.56	0.0860	499.39	0.3513
254.97	0.0049	395.35	0.1028	503.52	0.3707
262.35	0.0061	408.79	0.1197	506.49	0.3903
268.90	0.0075	419.89	0.1368	509.11	0.4105
274.14	0.0089	429.82	0.1540	511.94	0.4314
279.24	0.0104	438.64	0.1711	514.21	0.4528
283.65	0.0119	448.09	0.1884	516.35	0.4752
288.13	0.0134	454.92	0.2058	516.49	0.4987

Table 6. Test data for specimen I2V–23

Test Number	: 119	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 235.8 MPa	Ultimate Stress	: 637.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.00	384.59	0.0324	603.57	0.3157
43.6040	0.00	386.62	0.0330	605.86	0.3371
190.25	0.0015	436.18	0.0642	611.71	0.3616
274.48	0.0042	457.78	0.0815	615.35	0.3771
296.47	0.0056	479.29	0.0983	619.50	0.3984
303.00	0.0063	486.13	0.1062	631.01	0.4890
333.23	0.0116	534.59	0.1614	634.39	0.5164
360.34	0.0208	574.76	0.2402	637.33	0.5749

Table 7. Test data for specimen I3C–14

Test Number	: 121	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 278.2 MPa	Ultimate Stress	: 633.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
1.04	0.0000	430.45	0.0536	590.35	0.2479
68.95	0.0005	451.69	0.0731	606.17	0.2892
196.77	0.0028	474.35	0.0867	606.87	0.2891
283.55	0.0054	482.80	0.0930	613.18	0.3155
311.96	0.0082	492.80	0.0997	623.97	0.3807
324.49	0.0099	526.96	0.1350	624.47	0.3806
356.89	0.0172	562.69	0.1863	631.93	0.4557
378.50	0.0253	564.45	0.1916	633.91	0.5043
414.69	0.0429				

Table 8. Test data for specimen I3V–38

Test Number	: 215	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 255.0 MPa	Ultimate Stress	: 609.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.31	0.0001	343.18	0.0197	512.07	0.1530
58.64	0.0005	358.13	0.0259	519.27	0.1633
91.12	0.0008	370.99	0.0320	532.16	0.1839
127.95	0.0010	382.74	0.0381	544.08	0.2045
152.36	0.0013	393.50	0.0443	556.49	0.2295
176.22	0.0015	403.34	0.0504	567.12	0.2547
188.00	0.0017	412.73	0.0565	577.22	0.2819
199.29	0.0019	421.62	0.0626	587.01	0.3138
219.44	0.0024	429.86	0.0687	594.55	0.3440
242.09	0.0032	441.64	0.0780	601.63	0.3814
259.00	0.0043	451.14	0.0861	606.43	0.4150
272.01	0.0053	460.27	0.0943	608.93	0.4501
285.98	0.0067	468.83	0.1025	607.43	0.4928
297.47	0.0082	476.91	0.1107	588.07	0.5213
310.53	0.0105	487.33	0.1222	554.04	0.5400
321.27	0.0129	496.22	0.1325	508.75	0.5549
332.68	0.0161	504.19	0.1428	451.10	0.5656

Table 9. Test data for specimen I3V–39

Test Number	: 120	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 282.5 MPa	Ultimate Stress	: 452.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.44	0.0000	364.62	0.0269		
58.55	0.0009	389.67	0.0413		
210.64	0.0036	409.75	0.0553		
276.76	0.0058	430.67	0.0701		
309.50	0.0089	443.50	0.0803		
323.52	0.0115	450.68	0.0874		
344.97	0.0180				

Table 10. Test data for specimen I1V–26

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 281.3 MPa	Ultimate Stress	: 615.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.34	0.0001	347.91	0.0144	557.72	0.2101
31.65	0.0002	352.25	0.0159	565.99	0.2270
64.74	0.0004	356.46	0.0174	573.44	0.2439
103.42	0.0006	359.98	0.0188	579.44	0.2612
143.27	0.0009	391.35	0.0337	585.30	0.2787
184.43	0.0012	417.68	0.0495	590.05	0.2964
222.36	0.0016	440.92	0.0652	594.95	0.3145
252.42	0.0022	460.09	0.0809	598.67	0.3329
274.20	0.0032	477.32	0.0968	603.08	0.3518
290.48	0.0044	492.70	0.1126	605.91	0.3710
303.23	0.0057	505.73	0.1286	609.43	0.3908
314.47	0.0071	518.76	0.1447	611.56	0.4114
323.09	0.0085	529.10	0.1609	612.74	0.4330
330.53	0.0099	540.76	0.1771	613.22	0.4560
336.46	0.0114	549.58	0.1936	613.22	0.4813
341.98	0.0128				

Table 11. Test data for specimen I1V–27

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 303.4 MPa	Ultimate Stress	: 644.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.82	0.0001	374.25	0.0113	593.22	0.2240
33.72	0.0002	379.76	0.0126	600.40	0.2404
65.98	0.0003	384.11	0.0139	605.91	0.2568
103.90	0.0005	390.73	0.0152	611.84	0.2735
143.41	0.0007	421.34	0.0303	616.18	0.2903
184.02	0.0009	448.30	0.0466	619.63	0.3075
222.98	0.0013	471.33	0.0628	623.98	0.3248
257.31	0.0018	489.67	0.0789	627.01	0.3422
283.24	0.0025	508.01	0.0950	630.32	0.3599
303.44	0.0034	523.38	0.1110	633.35	0.3779
320.68	0.0044	536.21	0.1270	634.94	0.3962
333.64	0.0054	548.48	0.1431	637.97	0.4149
344.60	0.0066	559.16	0.1591	639.28	0.4337
353.49	0.0077	569.44	0.1753	641.76	0.4529
361.63	0.0089	579.78	0.1916	642.18	0.4723
367.01	0.0101	587.64	0.2078	643.83	0.4919

Table 12. Test data for specimen I2V–19

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 314.7 MPa	Ultimate Stress	: 642.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
23.79	0.0001	360.04	0.0100	592.47	0.2152
36.75	0.0002	365.49	0.0114	600.67	0.2344
71.08	0.0004	372.94	0.0129	605.50	0.2538
107.08	0.0004	376.38	0.0144	612.74	0.2736
144.24	0.0006	380.59	0.0159	617.56	0.2939
182.99	0.0008	418.10	0.0331	620.60	0.3144
220.63	0.0010	445.61	0.0510	627.56	0.3352
250.69	0.0013	470.91	0.0689	629.22	0.3567
278.55	0.0019	491.04	0.0867	632.59	0.3786
297.92	0.0028	509.80	0.1045	634.80	0.4009
314.75	0.0038	541.58	0.1226	637.97	0.4240
326.47	0.0049	554.48	0.1408	638.59	0.4480
338.39	0.0060	564.54	0.1591	639.97	0.4728
347.01	0.0073	575.30	0.1775	640.18	0.4988
355.42	0.0086	583.64	0.1962	640.32	0.5265

Table 13. Test data for specimen I2V–03

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 169.2 MPa	Ultimate Stress	: 409.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
35.99	0.0001	203.12	0.0108	358.94	0.1225
35.44	0.0001	205.67	0.0119	365.28	0.1303
36.40	0.0001	208.36	0.0130	369.63	0.1372
39.44	0.0001	225.11	0.0202	374.18	0.1472
59.29	0.0002	240.97	0.0283	381.00	0.1534
85.15	0.0004	255.24	0.0362	381.62	0.1643
108.32	0.0007	268.14	0.0440	386.93	0.1751
128.10	0.0011	279.58	0.0518	391.76	0.1779
145.76	0.0016	292.06	0.0596	393.83	0.1911
160.17	0.0023	303.71	0.6750	398.03	0.1995
170.44	0.0031	312.26	0.0752	397.90	0.2061
177.68	0.0040	320.54	0.0830	401.55	0.2118
184.16	0.0051	331.43	0.0909	403.89	0.2261
189.67	0.0062	339.43	0.0988	405.76	0.2345
194.16	0.0073	346.67	0.1066	406.10	0.2451
196.85	0.0084	353.15	0.1145	407.76	0.2464
202.15	0.0096				

Table 14. Test data for specimen I2V–06

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 178.5 MPa	Ultimate Stress	: 402.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.44	0.0002	200.43	0.0101	332.19	0.0994
21.93	0.0002	202.71	0.0113	341.01	0.1090
42.20	0.0003	205.26	0.0125	349.22	0.1187
69.43	0.0005	207.26	0.0137	355.84	0.1289
97.49	0.0007	210.57	0.0148	362.32	0.1386
128.38	0.0009	210.98	0.0158	370.59	0.1459
156.51	0.0011	228.91	0.0243	373.42	0.1578
168.37	0.0019	246.90	0.0339	378.25	0.1660
175.33	0.0029	262.76	0.0435	382.04	0.1801
182.64	0.0041	277.10	0.0527	383.76	0.1921
185.74	0.0053	291.79	0.0620	391.42	0.2000
189.81	0.0064	302.75	0.0713	395.21	0.2108
193.95	0.0077	313.23	0.0808	396.79	0.2269
197.05	0.0089	324.12	0.0900	401.62	0.2296

Table 15. Test data for specimen I3C–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 158.6 MPa	Ultimate Stress	: 387.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
35.16	0.0003	192.85	0.0113	324.88	0.0940
36.06	0.0003	195.88	0.0123	333.02	0.1021
57.23	0.0003	198.71	0.0135	340.39	0.1101
84.32	0.0005	201.40	0.0146	346.19	0.1185
109.70	0.0008	202.64	0.0156	353.08	0.1266
128.38	0.0013	218.49	0.0228	358.25	0.1353
145.27	0.0018	233.87	0.0308	363.28	0.1441
155.27	0.0026	248.69	0.0385	365.01	0.1539
163.54	0.0035	262.35	0.0464	371.49	0.1614
169.68	0.0045	274.69	0.0542	377.76	0.1728
176.16	0.0056	285.24	0.0621	377.49	0.1832
180.78	0.0068	297.78	0.0701	383.97	0.1869
183.40	0.0079	307.85	0.0781	384.38	0.2002
187.40	0.0090	315.02	0.0861	386.73	0.2136
190.36	0.0102				

Table 16. Test data for specimen I2V–24

Test Number	: 090	Test Temp.	: 290°C
Aging Temp.	: 320℃	Aging Time	: 30,000 h
Yield Stress	: 178.6 MPa	Ultimate Stress	: 445.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
145.28	0.0011	248.73	0.0102	350.28	0.0706
165.45	0.0018	255.47	0.0126	361.52	0.0803
170.86	0.0020	261.78	0.0148	373.89	0.0909
176.52	0.0023	268.08	0.0173	377.04	0.0939
181.88	0.0027	273.89	0.0201	388.48	0.1034
186.90	0.0031	278.61	0.0224	395.83	0.1118
192.32	0.0036	288.66	0.0276	405.30	0.1248
197.14	0.0041	293.19	0.0301	411.18	0.1355
200.83	0.0043	298.51	0.0332	419.91	0.1487
203.93	0.0045	304.37	0.0368	423.28	0.1560
208.75	0.0048	310.28	0.0406	427.33	0.1655
214.56	0.0051	314.66	0.0435	432.37	0.1787
221.25	0.0055	318.95	0.0464	435.88	0.1861
227.85	0.0059	323.97	0.0501	437.63	0.1982
232.77	0.0063	329.34	0.0542	437.74	0.2033
238.04	0.0071	485.56	0.0585	440.28	0.2202
241.93	0.0080	340.13	0.0626	441.22	0.2253

Table 17. Test data for specimen I3C–15

Test Number	: 089	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 163.6 MPa	Ultimate Stress	: 427.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
135.46	0.0010	290.05	0.0352	389.27	0.1184
140.82	0.0012	293.13	0.0374	393.63	0.1243
166.39	0.0022	296.36	0.0392	398.03	0.1307
184.42	0.0035	299.43	0.0416	403.25	0.1394
193.07	0.0044	309.75	0.0487	407.55	0.1466
200.97	0.0054	315.76	0.0531	409.39	0.1497
226.12	0.0074	323.77	0.0594	410.97	0.1528
233.47	0.0081	485.56	0.0717	419.81	0.1723
241.11	0.0099	346.25	0.0783	420.88	0.1743
244.69	0.0112	348.99	0.0805	423.02	0.1809
247.82	0.0125	355.71	0.0863	424.34	0.1860
250.90	0.0138	362.14	0.0916	425.25	0.1888
254.62	0.0156	364.72	0.0942	425.76	0.1916
257.80	0.0170	367.02	0.0962	425.83	0.1943
261.08	0.0185	369.00	0.0985	426.28	0.1977
284.03	0.0315	386.36	0.1142	427.03	0.2017
286.92	0.0333	387.86	0.1162	427.24	0.2045

Table 18. Test data for specimen I3V–40

Test Number	: 088	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Y	– MPa	Ultimate Stress	: 470.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
212.71	0.0017	380.70	0.0127	437.61	0.0570
224.61	0.0019	384.77	0.0143	442.37	0.0625
235.42	0.0020	388.73	0.0160	445.21	0.0676
246.68	0.0022	392.05	0.0174	448.56	0.0720
258.83	0.0024	394.94	0.0189	452.66	0.0794
271.47	0.0026	485.56	0.0205	454.44	0.0826
288.43	0.0029	402.90	0.0238	453.98	0.0874
298.12	0.0032	408.90	0.0280	454.42	0.0916
308.54	0.0035	411.34	0.0299	456.78	0.0958
318.12	0.0038	417.04	0.0347	457.92	0.0982
329.87	0.0043	420.85	0.0378	459.79	0.1004
334.79	0.0047	422.94	0.0396	461.50	0.1053
341.12	0.0052	424.50	0.0416	462.96	0.1100
346.43	0.0056	426.73	0.0440	463.79	0.1144
355.36	0.0068	429.70	0.0472	464.36	0.1164
361.00	0.0078	432.42	0.0507	465.60	0.1235
367.97	0.0090	434.51	0.0529		

Table 19. Test data for specimen I1V–28

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 192.4 MPa	Ultimate Stress	: 381.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.82	0.0002	225.39	0.0091	329.78	0.0585
28.06	0.0002	229.39	0.0101	333.22	0.0618
46.54	0.0003	233.11	0.0110	339.02	0.0652
66.60	0.0004	240.76	0.0134	342.60	0.0686
95.22	0.0006	251.31	0.0170	346.81	0.0719
122.11	0.0007	259.31	0.0205	351.56	0.0753
146.24	0.0009	268.27	0.0240	356.39	0.0784
160.23	0.0012	274.96	0.0275	360.18	0.0816
173.33	0.0018	282.89	0.0310	362.32	0.0846
183.88	0.0024	288.96	0.0345	364.39	0.0876
191.61	0.0032	294.27	0.0379	368.59	0.0903
198.57	0.0040	301.99	0.0414	371.83	0.0932
204.36	0.0048	309.09	0.0448	373.35	0.0959
209.74	0.0056	314.26	0.0482	374.73	0.0984
215.19	0.0065	318.54	0.0516	377.90	0.1007
218.43	0.0073	324.81	0.0551	380.66	0.1021
222.36	0.0082				

Table 20. Test data for specimen I1V–29

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 189.0 MPa	Ultimate Stress	: 442.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.55	0.0001	211.46	0.0057	375.21	0.0873
21.17	0.0001	214.77	0.0065	384.66	0.0953
21.79	0.0001	219.80	0.0074	391.62	0.1035
38.13	0.0002	224.15	0.0082	398.52	0.1117
55.71	0.0003	226.84	0.0090	405.27	0.1201
78.19	0.0004	246.00	0.0150	409.55	0.1286
102.80	0.0006	265.93	0.0219	414.86	0.1372
126.45	0.0008	281.10	0.0290	421.41	0.1458
148.38	0.0011	296.47	0.0362	424.72	0.1547
164.30	0.0015	311.09	0.0434	429.89	0.1639
175.40	0.0021	324.26	0.0506	432.58	0.1731
185.40	0.0027	334.95	0.0578	434.99	0.1829
192.71	0.0034	344.88	0.0650	436.92	0.1925
199.26	0.0041	357.36	0.0724	438.92	0.2046
205.74	0.0049	366.53	0.0798	442.02	0.2140

Table 21. Test data for specimen I2V–20

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 179.1 MPa	Ultimate Stress	: 437.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
24.06	0.0001	215.74	0.0090	383.28	0.1135
24.41	0.0001	221.11	0.0100	390.66	0.1231
38.20	0.0002	222.29	0.0111	397.55	0.1331
56.88	0.0004	226.42	0.0123	402.17	0.1432
81.01	0.0005	229.11	0.0135	408.79	0.1534
106.73	0.0008	252.42	0.0218	413.75	0.1636
129.48	0.0010	270.62	0.0309	417.55	0.1743
148.51	0.0015	288.61	0.0398	423.27	0.1854
163.34	0.0021	305.44	0.0487	424.99	0.1966
174.37	0.0029	319.85	0.0576	429.54	0.2086
183.61	0.0037	333.29	0.0667	430.85	0.2210
192.36	0.0047	344.32	0.0758	432.23	0.2336
199.88	0.0057	354.74	0.0852	435.89	0.2483
204.15	0.0067	365.28	0.0945	436.30	0.2624
209.74	0.0078	373.42	0.1039	436.78	0.2795

Table 22. Test data for specimen P21T–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 216.3 MPa	Ultimate Stress	: 538.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
75.77	0.0002	225.73	0.0031	263.10	0.0101
95.56	0.0003	232.84	0.0038	267.31	0.0110
112.94	0.0004	239.59	0.0047	267.93	0.0120
133.55	0.0005	245.38	0.0055	271.93	0.0130
154.30	0.0007	248.90	0.0063	272.62	0.0141
171.47	0.0010	253.38	0.0073	275.38	0.0152
189.81	0.0014	257.59	0.0082	279.31	0.0164
204.64	0.0018	259.66	0.0091	280.13	0.0174
215.53	0.0025				

Table 23. Test data for specimen P23T–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 238.1 MPa	Ultimate Stress	: 556.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	342.95	0.0845	358.18	0.2337
59.50	0.0004	347.50	0.0975	358.18	0.2444
136.45	0.0010	349.08	0.1064	358.18	0.2560
212.36	0.0024	350.46	0.1406	358.18	0.2653
226.56	0.0032	350.46	0.1474	358.18	0.2736
246.14	0.0052	350.46	0.1587	358.18	0.2837
256.35	0.0064	349.08	0.1633	358.18	0.2953
268.90	0.0094	350.94	0.1683	361.97	0.3024
282.34	0.0142	352.87	0.1755	361.97	0.3118
294.41	0.0198	353.15	0.1798	365.22	0.3214
304.06	0.0263	354.46	0.1848	365.22	0.3297
313.44	0.0330	356.32	0.1901	368.66	0.3373
321.99	0.0398	357.70	0.1973	368.66	0.3398
332.19	0.0504	356.87	0.2048	368.66	0.3472
337.84	0.0584	358.18	0.2124	368.66	0.3547
342.95	0.0687	358.18	0.2225		

Table 24. Test data for specimen P22A–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 206.4 MPa	Ultimate Stress	: 561.7 MPa

Experimental Data Not Available.

Table 25. Test data for specimen P23A–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 216.7 MPa	Ultimate Stress	: 536.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
33.72	0.0000	210.84	0.0025	260.28	0.0105
49.92	0.0002	218.70	0.0031	262.97	0.0113
66.47	0.0003	225.94	0.0037	265.17	0.0123
97.77	0.0004	232.56	0.0045	268.28	0.0132
118.04	0.0005	237.73	0.0053	270.62	0.0141
139.14	0.0007	243.45	0.0061	272.83	0.0151
156.44	0.0009	246.83	0.0070	275.31	0.0160
171.06	0.0011	250.56	0.0078	277.10	0.0170
185.47	0.0014	254.42	0.0087	280.00	0.0180
199.53	0.0019	257.24	0.0096		

Table 26. Test data for specimen P22T–16

Test Number	: 116	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 247.0 MPa	Ultimate Stress	: 580.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
43.91	0.0000	342.66	0.0248	481.02	0.1430
189.97	0.0015	363.69	0.0376	485.81	0.1553
201.17	0.0018	388.73	0.0551	508.05	0.1923
223.14	0.0021	421.22	0.0830	526.44	0.2290
261.09	0.0032	448.33	0.1060	541.88	0.2665
275.55	0.0042	468.51	0.1272	562.32	0.3484
303.36	0.0088	475.56	0.1355	576.12	0.4433
323.48	0.0172	477.51	0.1399	580.05	0.5090

Table 27. Test data for specimen P21A–31

Test Number	: 114	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 242.6 MPa	Ultimate Stress	: 571.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	373.76	0.0571	514.47	0.2440
48.35	0.0003	394.21	0.0734	531.02	0.2859
203.54	0.0031	427.78	0.1008	530.23	0.2862
227.32	0.0036	451.32	0.1276	560.39	0.4079
259.89	0.0049	465.92	0.1452	560.29	0.4077
276.22	0.0068	465.92	0.1455	565.28	0.4623
292.42	0.0101	478.12	0.1651	568.19	0.4721
314.12	0.0183	484.73	0.1799	571.09	0.5044
315.90	0.0196	487.58	0.1871	570.99	0.5495
332.18	0.0273				

Table 28. Test data for specimen P25A–28

Test Number	: 111	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 223.9 MPa	Ultimate Stress	: 548.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	321.89	0.0234	476.75	0.1723
86.41	0.0002	347.19	0.0401	483.95	0.1925
155.03	0.0009	368.69	0.0567	504.89	0.2369
194.51	0.0016	383.86	0.0691	511.41	0.2558
213.11	0.0023	405.18	0.0880	512.94	0.2598
241.77	0.0025	419.23	0.0991	529.77	0.3109
261.95	0.0042	436.03	0.1167	536.79	0.3411
269.65	0.0052	447.42	0.1308	543.63	0.3742
287.33	0.0090	457.87	0.1450	548.27	0.4148
301.36	0.0135	458.27	0.1448		

Table 29. Test data for specimen P21A–36

Test Number	: 286	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 58,000 h
Yield Stress	: 263.6 MPa	Ultimate Stress	: 583.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
18.696	0.0001	427.554	0.0875	548.057	0.2827
24.618	0.0001	440.192	0.1004	557.686	0.3122
39.860	0.0001	455.767	0.1178	562.137	0.3283
134.443	0.0005	464.743	0.1290	565.863	0.3422
215.831	0.0011	466.431	0.1312	573.991	0.3795
253.721	0.0024	494.156	0.1706	574.572	0.3819
275.165	0.0041	495.511	0.1728	578.927	0.4081
361.799	0.0360	513.365	0.2038	580.330	0.4189
365.350	0.0382	514.574	0.2060	583.281	0.4486
387.177	0.0531	535.041	0.2491	583.475	0.4507
400.952	0.0638	535.864	0.2514	583.813	0.4631

Table 30. Test data for specimen P24T–14

Test Number	: 118	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 229.4 MPa	Ultimate Stress	: 600.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
1.08	0.0000	368.40	0.0424	521.97	0.2166
72.59	0.0001	395.11	0.0601	542.22	0.2682
207.27	0.0022	421.93	0.0814	560.21	0.3171
241.78	0.0027	444.92	0.1003	571.16	0.3615
272.19	0.0048	467.12	0.1241	579.92	0.4024
285.75	0.0067	474.79	0.1323	594.04	0.5004
307.05	0.0117	486.37	0.1514	599.32	0.5632
326.49	0.0178	500.36	0.1771	600.04	0.6237
340.41	0.0239				

Table 31. Test data for specimen P25T–10

Test Number	: 109	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Y	.1 MPa	Ultimate Stress	: 581.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	414.63	0.0790	534.40	0.2365
64.28	0.0003	443.49	0.0996	537.07	0.2424
164.98	0.0022	452.36	0.1085	540.08	0.2500
198.69	0.0024	466.92	0.1227	541.90	0.2527
213.37	0.0029	469.64	0.1279	547.20	0.2668
219.84	0.0030	478.91	0.1372	566.01	0.3318
249.13	0.0040	484.19	0.1494	567.78	0.3355
251.89	0.0043	493.73	0.1618	572.87	0.3572
275.62	0.0069	499.40	0.1732	572.56	0.3660
287.20	0.0091	501.58	0.1740	574.42	0.3763
300.95	0.0124	505.86	0.1857	574.32	0.3757
320.76	0.0189	511.37	0.1946	576.85	0.3951
339.21	0.0279	517.49	0.2045	579.98	0.4058
366.24	0.0431	526.82	0.2223	581.80	0.4462
394.74	0.0629	531.63	0.2313		

Table 32. Test data for specimen P22A–36

Test Number	: 113	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 237.4 MPa	Ultimate Stress	: 603.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	437.15	0.0830	521.86	0.1973
67.86	0.0001	455.92	0.0989	541.57	0.2361
195.99	0.0015	465.90	0.1055	563.14	0.2942
220.01	0.0020	471.02	0.1109	563.62	0.2993
260.93	0.0031	481.35	0.1347	577.37	0.3565
283.12	0.0050	484.70	0.1395	582.02	0.3841
295.07	0.0065	497.55	0.1568	583.56	0.3885
312.40	0.0099	504.35	0.1669	590.65	0.4283
330.98	0.0152	510.57	0.1782	601.19	0.5273
361.40	0.0298	516.28	0.1882	602.66	0.5777
391.84	0.0483	521.81	0.1946	602.98	0.6590
414.44	0.0649				

Table 33. Test data for specimen P21A–19

Test Number	: 283	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 249.7 MPa	Ultimate Stress	: 605.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.30	0.0001	351.39	0.0260	523.10	0.1626
19.83	0.0001	372.83	0.0360	524.69	0.1646
57.42	0.0003	376.63	0.0380	530.32	0.1726
68.12	0.0003	398.34	0.0500	538.61	0.1846
127.65	0.0006	401.60	0.0520	546.12	0.1966
140.24	0.0007	404.98	0.0540	556.47	0.2146
152.69	0.0008	420.58	0.0640	563.74	0.2287
207.14	0.0015	426.26	0.0679	564.75	0.2307
223.63	0.0020	443.08	0.0802	571.49	0.2450
259.10	0.0039	445.53	0.0822	577.56	0.2593
266.89	0.0046	462.18	0.0963	581.56	0.2695
273.90	0.0053	473.10	0.1064	582.28	0.2715
308.66	0.0113	487.57	0.1207	594.80	0.3112
314.87	0.0129	500.52	0.1347	599.37	0.3304

Table 34. Test data for specimen P22T–04

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 252.3 MPa	Ultimate Stress	: 601.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
59.78	0.0003	314.81	0.0148	546.62	0.2670
91.70	0.0004	320.54	0.0163	552.41	0.2844
125.00	0.0006	362.39	0.0358	559.72	0.3022
160.85	0.0008	404.72	0.0641	564.40	0.3201
196.16	0.0011	424.99	0.0808	570.20	0.3379
217.81	0.0017	441.82	0.0974	575.16	0.3561
239.45	0.0024	457.81	0.1139	579.16	0.3743
254.35	0.0033	470.64	0.1306	583.37	0.3926
268.28	0.0044	482.98	0.1474	584.61	0.4112
277.24	0.0056	494.84	0.1641	588.33	0.4299
285.86	0.0068	506.70	0.1811	589.98	0.4487
290.41	0.0081	517.52	0.1982	592.81	0.4679
298.41	0.0094	524.62	0.2154	596.67	0.4868
302.13	0.0107	533.38	0.2325	596.05	0.5056
306.82	0.0121	541.10	0.2496	597.36	0.5240
314.88	0.0134				

Table 35. Test data for specimen P23A–14

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 249.2 MPa	Ultimate Stress	: 594.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.82	0.0002	288.48	0.0086	537.79	0.2465
43.37	0.0003	294.27	0.0096	545.58	0.2655
66.26	0.0004	297.51	0.0107	552.96	0.2845
93.22	0.0005	302.68	0.0119	557.85	0.3039
121.28	0.0006	342.53	0.0278	565.85	0.3237
149.00	0.0008	374.73	0.0461	570.82	0.3436
175.54	0.0010	402.93	0.0655	571.92	0.3637
199.81	0.0014	437.27	0.1004	579.85	0.3844
220.63	0.0019	458.85	0.1176	580.61	0.4054
238.08	0.0027	474.22	0.1356	585.02	0.4267
250.28	0.0035	486.49	0.1538	588.54	0.4487
259.24	0.0044	498.63	0.1720	588.61	0.4714
270.14	0.0054	510.56	0.1904	590.74	0.4951
275.03	0.0064	521.38	0.2090	592.40	0.5204
285.10	0.0075	529.79	0.2277		

Table 36. Test data for specimen P23A–36

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 265.2 MPa	Ultimate Stress	: 608.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
3.17	0.0002	298.20	0.0106	548.34	0.2622
33.58	0.0002	301.30	0.0119	556.82	0.2838
61.98	0.0004	306.13	0.0131	564.13	0.3057
94.32	0.0005	308.13	0.0144	571.44	0.3279
130.66	0.0008	311.92	0.0157	576.61	0.3503
166.03	0.0010	355.42	0.0359	581.64	0.3732
203.81	0.0012	388.17	0.0576	585.92	0.3961
237.66	0.0015	418.30	0.0798	590.19	0.4196
254.76	0.0024	455.95	0.1164	593.50	0.4435
262.21	0.0034	474.29	0.1365	597.57	0.4676
271.24	0.0045	490.22	0.1572	600.12	0.4922
279.10	0.0057	504.35	0.1778	602.19	0.5174
282.82	0.0069	517.18	0.1986	603.91	0.5429
289.44	0.0081	528.48	0.2196	606.33	0.5689
292.96	0.0093	539.17	0.2409	607.98	0.5955

Table 37. Test data for specimen P22T–11

Test Number	: 110	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 249.3 MPa	Ultimate Stress	: 628.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	437.70	0.0736	578.79	0.2605
63.87	0.0003	459.69	0.0898	582.98	0.2690
203.91	0.0025	471.05	0.0973	587.96	0.2787
222.66	0.0028	484.95	0.1108	589.58	0.2852
229.32	0.0029	497.35	0.1235	592.32	0.2982
249.74	0.0036	518.00	0.1476	594.90	0.3027
286.31	0.0062	521.30	0.1541	597.52	0.3136
300.38	0.0080	527.36	0.1624	603.41	0.3340
333.68	0.0158	536.88	0.1732	607.02	0.3542
370.93	0.0297	540.59	0.1816	610.92	0.3707
377.32	0.0333	549.45	0.1968	614.92	0.3913
388.17	0.0403	563.77	0.2188	621.68	0.4432
403.38	0.0502	564.52	0.2301	623.50	0.4576
417.59	0.0575	569.11	0.2389	625.01	0.4709
432.23	0.0689	573.91	0.2496	628.40	0.5554

Table 38. Test data for specimen P22A–13

Test Number	: 112	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 245.5 MPa	Ultimate Stress	: 615.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	382.98	0.0400	570.86	0.2623
92.46	0.0003	402.17	0.0535	580.24	0.2911
194.32	0.0016	424.97	0.0691	581.92	0.2985
216.44	0.0019	451.94	0.0896	583.79	0.3018
228.12	0.0021	474.33	0.1065	589.03	0.3270
266.02	0.0036	479.54	0.1115	590.51	0.3272
281.00	0.0048	484.08	0.1211	601.41	0.3777
301.46	0.0076	509.21	0.1497	602.22	0.3855
321.99	0.0124	509.31	0.1496	607.76	0.4254
335.17	0.0174	537.42	0.1913	614.32	0.4766
358.57	0.0266	554.68	0.2264	615.39	0.5406

Table 39. Test data for specimen P24A–32

Test Number	: 115	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 225.4 MPa	Ultimate Stress	: 617.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	359.05	0.0305	528.87	0.1818
187.93	0.0013	382.89	0.0445	561.70	0.2462
204.63	0.0014	421.03	0.0707	580.29	0.2982
216.16	0.0017	444.60	0.0878	591.20	0.3395
254.69	0.0030	476.19	0.1127	602.95	0.3998
285.18	0.0065	484.47	0.1257	612.92	0.4005
306.94	0.0101	510.06	0.1561	617.20	0.5470
336.38	0.0197				

Table 40. Test data for specimen P24T–05

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 233.5 MPa	Ultimate Stress	: 603.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.13	0.0000	301.65	0.0126	534.27	0.1735
40.20	0.0003	306.54	0.0138	542.62	0.1860
74.95	0.0005	311.02	0.0149	549.72	0.1985
112.38	0.0007	314.61	0.0162	558.41	0.2112
147.27	0.0010	345.36	0.0276	565.23	0.2240
176.64	0.0014	373.01	0.0399	571.64	0.2369
201.53	0.0020	395.90	0.0521	575.99	0.2497
220.91	0.0028	415.34	0.0643	580.68	0.2629
237.25	0.0037	433.40	0.0763	585.09	0.2763
250.28	0.0047	449.81	0.0884	590.60	0.2898
261.17	0.0057	466.09	0.1004	592.88	0.3034
269.86	0.0068	479.32	0.1124	595.57	0.3171
277.51	0.0079	492.42	0.1246	599.43	0.3312
284.34	0.0090	504.63	0.1368	600.46	0.3455
292.13	0.0102	513.80	0.1489	601.77	0.3599
296.96	0.0114	525.38	0.1613		

Table 41. Test data for specimen P24A–04

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 236.2 MPa	Ultimate Stress	: 616.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
23.72	0.0002	284.41	0.0091	528.07	0.1661
33.44	0.0002	287.86	0.0101	536.89	0.1786
62.74	0.0004	294.96	0.0111	544.69	0.1912
93.01	0.0005	237.66	0.0122	551.30	0.2036
124.45	0.0007	303.51	0.0133	558.27	0.2160
150.58	0.0009	339.15	0.0247	565.16	0.2283
177.47	0.0012	365.70	0.0374	573.78	0.2406
197.88	0.0016	388.31	0.0498	578.54	0.2530
218.15	0.0023	410.17	0.0625	582.19	0.2652
232.35	0.0031	430.09	0.0757	586.95	0.2776
246.21	0.0041	447.61	0.0892	594.26	0.2894
255.31	0.0050	476.77	0.1165	596.60	0.3015
263.66	0.0060	493.87	0.1285	600.74	0.3135
272.96	0.0070	504.35	0.1410	602.33	0.3252
276.82	0.0080	515.73	0.1535	606.46	0.3367

Table 42. Test data for specimen P21T–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Y	.3 MPa	Ultimate Stress	: 387.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.07	0.0000	181.95	0.0074	247.11	0.0423
25.86	0.0005	194.16	0.0097	250.56	0.0465
36.68	0.0007	204.02	0.0125	253.52	0.0509
67.84	0.0012	211.53	0.0153	256.14	0.0551
83.63	0.0016	217.60	0.0182	259.59	0.0594
100.66	0.0020	224.56	0.0217	261.73	0.0639
117.90	0.0026	230.97	0.0257	264.28	0.0682
135.00	0.0032	235.32	0.0299	267.52	0.0726
152.37	0.0043	240.01	0.0340	269.45	0.0772
167.20	0.0056	243.52	0.0381		

Table 43. Test data for specimen P23T–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 154.2 MPa	Ultimate Stress	: 405.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
4.48	0.0001	53.71	0.0005	140.17	0.0022
10.20	0.0001	70.40	0.0008	148.51	0.0029
14.89	0.0002	86.80	0.0009	154.58	0.0037
20.55	0.0003	101.70	0.0011	159.13	0.0045
29.99	0.0003	117.69	0.0013	163.61	0.0056
41.71	0.0004	130.59	0.0017	166.99	0.0064

Table 44. Test data for specimen P22A–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 137.9 MPa	Ultimate Stress	: 406.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
10.69	0.0002	61.78	0.0009	154.37	0.0079
12.41	0.0002	74.12	0.0011	156.58	0.0089
14.27	0.0002	89.01	0.0013	159.82	0.0099
15.38	0.0002	102.32	0.0015	161.61	0.0107
16.27	0.0002	113.63	0.0019	164.16	0.0117
17.37	0.0003	123.07	0.0024	166.92	0.0125
18.48	0.0003	131.07	0.0030	168.09	0.0134
19.72	0.0003	136.31	0.0037	170.37	0.0144
21.03	0.0003	141.00	0.0045	172.78	0.0152
25.65	0.0004	144.86	0.0053	174.44	0.0161
31.65	0.0004	148.51	0.0062	176.37	0.0171

Table 45. Test data for specimen P23A–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 144.0 MPa	Ultimate Stress	: 385.1 MPa

Experimental Data Not Available.

Table 46. Test data for specimen P21A–32

Test Number	: 267	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 162.3 MPa	Ultimate Stress	: 403.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
44.672	0.0002	242.806	0.0422	371.405	0.1684
46.773	0.0002	259.901	0.0536	372.644	0.1705
102.361	0.0003	283.979	0.0711	381.782	0.1884
111.518	0.0004	292.211	0.0774	382.837	0.1905
120.420	0.0005	312.492	0.0948	387.358	0.2027
127.914	0.0006	319.388	0.1015	396.616	0.2282
165.299	0.0031	332.218	0.1146	397.642	0.2353
170.403	0.0042	338.126	0.1215	400.346	0.2485
186.100	0.0097	345.534	0.1300	402.929	0.2595
191.021	0.0117	355.655	0.1437	402.216	0.2615
218.343	0.0270	360.315	0.1504	403.421	0.2727

Table 47. Test data for specimen P21A–33

Test Number	: 070	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 155.2 MPa	Ultimate Stress	: 405.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
126.22	0.0010	231.75	0.0186	351.63	0.1175
159.63	0.0024	237.87	0.0205	354.16	0.1213
164.81	0.0030	242.83	0.0232	362.63	0.1327
168.80	0.0036	250.06	0.0283	365.60	0.1367
172.02	0.0041	254.96	0.0320	368.00	0.1402
179.21	0.0057	260.16	0.0359	374.97	0.1516
184.07	0.0069	266.55	0.0410	381.91	0.1652
187.40	0.0082	275.01	0.0476	384.64	0.1709
192.53	0.0102	286.24	0.0572	388.73	0.1803
197.56	0.0123	297.42	0.0666	393.29	0.1924
202.25	0.0132	307.75	0.0757	396.45	0.2015
204.73	0.0139	318.13	0.0850	399.57	0.2143
208.74	0.0145	328.51	0.0948	401.57	0.2232
212.31	0.0151	336.87	0.1013	403.44	0.2319
217.96	0.0161	340.72	0.1052	405.35	0.2407
226.73	0.0177	345.13	0.1101	405.91	0.2449

Table 48. Test data for specimen P24T–16

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 148.2 MPa	Ultimate Stress	: 407.0 MPa

Experimental Data Not Available.

Table 49. Test data for specimen P21A–37

Test Number	: 316	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 58,000 h
Yield Stress	: 164.2 MPa	Ultimate Stress	: 410.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
24.800	0.000	190.360	0.009	360.330	0.134
59.530	0.000	196.230	0.011	390.370	0.183
70.650	0.000	235.510	0.031	394.480	0.192
81.700	0.000	246.880	0.038	396.880	0.199
112.760	0.001	261.030	0.047	400.100	0.208
121.120	0.001	267.710	0.051	400.920	0.211
128.690	0.001	280.710	0.060	409.240	0.243
135.470	0.001	298.400	0.073	409.740	0.246
154.940	0.002	333.400	0.104	409.940	0.248
161.630	0.003	335.600	0.106	410.590	0.257
167.120	0.003	351.350	0.123	410.590	0.259

Table 50. Test data for specimen P22T–17

Test Number	: 317	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 58,000 h
Y	177.5 MPa	Ultimate Stress	: 422.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.930	0.000	252.800	0.035	406.590	0.200
20.250	0.000	256.530	0.037	409.090	0.207
34.980	0.000	260.240	0.039	411.600	0.216
46.610	0.000	305.830	0.070	414.150	0.225
58.520	0.000	319.660	0.081	414.850	0.227
92.410	0.000	322.270	0.083	416.820	0.239
103.720	0.000	324.820	0.085	417.460	0.241
151.770	0.001	374.050	0.137	418.280	0.245
177.440	0.003	384.420	0.153	418.920	0.252
195.040	0.006	398.700	0.179	419.580	0.254
200.220	0.008	399.640	0.182	420.160	0.256

Table 51. Test data for specimen P21A–14

Test Number	: 075	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 153.2 MPa	Ultimate Stress	: 428.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	240.59	0.0126	339.96	0.0811
126.47	0.0007	247.15	0.0151	351.42	0.0912
140.94	0.0010	251.64	0.0176	364.20	0.1004
153.12	0.0015	257.87	0.0214	376.09	0.1122
161.24	0.0019	262.91	0.0242	390.12	0.1303
168.47	0.0023	268.07	0.0276	397.02	0.1402
179.44	0.0032	275.15	0.0318	404.68	0.1528
188.51	0.0046	280.09	0.0349	409.96	0.1637
197.32	0.0062	285.05	0.0386	414.54	0.1735
205.07	0.0073	291.29	0.0429	418.00	0.1823
212.49	0.0082	297.23	0.0470	419.93	0.1911
218.37	0.0089	302.06	0.0503	422.02	0.2012
223.76	0.0094	316.65	0.0616	424.43	0.2107
228.26	0.0100	323.63	0.0675	426.22	0.2229
233.74	0.0108	332.60	0.0748	428.89	0.2429

Table 52. Test data for specimen P21A–15

Test Number	: 268	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 163.9 MPa	Ultimate Stress	: 422.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
41.587	0.0002	181.122	0.0053	352.778	0.1018
57.834	0.0002	202.641	0.0119	368.889	0.1170
67.757	0.0002	207.981	0.0142	371.000	0.1192
87.450	0.0002	212.072	0.0162	390.322	0.1413
97.436	0.0003	221.866	0.0205	398.230	0.1522
106.786	0.0003	267.526	0.0440	403.850	0.1608
115.687	0.0004	274.437	0.0481	410.038	0.1718
123.186	0.0006	282.514	0.0526	415.142	0.1827
130.199	0.0006	292.529	0.0586	419.248	0.1936
169.039	0.0033	302.756	0.0651	420.728	0.1997
175.526	0.0042	318.588	0.0756	421.191	0.2021

Table 53. Test data for specimen P21A–16

Test Number	: 068	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 152.6 MPa	Ultimate Stress	: 407.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
117.51	0.0008	276.83	0.0394	369.41	0.1158
129.27	0.0011	288.36	0.0476	372.84	0.1193
139.60	0.0014	297.98	0.0550	378.80	0.1272
151.74	0.0020	305.49	0.0606	381.74	0.1318
162.95	0.0028	312.11	0.0658	385.80	0.1367
175.68	0.0043	317.36	0.0701	388.53	0.1428
186.25	0.0062	323.09	0.0746	392.00	0.1497
195.49	0.0086	329.66	0.0803	393.84	0.1562
202.07	0.0098	334.76	0.0849	396.52	0.1628
207.07	0.0106	340.40	0.0894	399.06	0.1698
218.81	0.0121	346.73	0.0946	401.88	0.1771
230.35	0.0137	351.53	0.0993	403.67	0.1841
243.26	0.0183	357.51	0.1028	405.27	0.1916
252.14	0.0232	362.26	0.1077	407.10	0.2028
264.26	0.0310	365.54	0.1113	407.71	0.2095

Table 54. Test data for specimen P25T–12

Test Number	: 313	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 171.4 MPa	Ultimate Stress	: 418.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
13.831	0.0001	218.952	0.0175	357.126	0.1115
19.288	0.0001	231.905	0.0240	361.320	0.1158
100.535	0.0001	244.707	0.0308	363.373	0.1180
124.689	0.0003	256.660	0.0375	376.516	0.1334
131.517	0.0005	267.876	0.0440	378.208	0.1355
156.203	0.0015	278.688	0.0506	384.704	0.1445
174.466	0.0033	292.401	0.0593	390.576	0.1532
180.836	0.0044	311.206	0.0723	406.128	0.1819
192.530	0.0072	325.432	0.0831	409.751	0.1909
198.021	0.0090	330.782	0.0875	410.687	0.1931
202.908	0.0108	348.084	0.1027	418.378	0.2268

Table 55. Test data for specimen P21A–18

Test Number	: 312	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 168.6 MPa	Ultimate Stress	: 416.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.303	0.0001	173.689	0.0032	319.676	0.0756
24.643	0.0001	196.740	0.0079	322.429	0.0777
64.311	0.0002	202.251	0.0096	338.256	0.0910
74.931	0.0002	228.815	0.0206	345.495	0.0973
86.046	0.0002	242.470	0.0274	350.063	0.1019
96.464	0.0003	250.870	0.0319	364.845	0.1172
123.313	0.0006	263.030	0.0386	377.614	0.1326
136.832	0.0008	270.539	0.0429	385.520	0.1439
142.711	0.0011	288.505	0.0539	397.627	0.1640
160.977	0.0021	295.124	0.0582	408.518	0.1883
167.872	0.0026	304.744	0.0648	415.626	0.2158

Table 56. Test data for specimen P21T–08

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 155.6 MPa	Ultimate Stress	: 423.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
37.65	0.0002	202.84	0.0139	359.91	0.1300
60.05	0.0003	206.57	0.0155	371.56	0.1418
85.01	0.0005	209.88	0.0170	379.90	0.1537
112.80	0.0008	212.77	0.0184	385.14	0.1657
132.66	0.0014	233.04	0.0288	393.00	0.1780
150.31	0.0024	252.97	0.0402	397.34	0.1906
162.79	0.0036	270.96	0.0513	402.24	0.2035
171.82	0.0049	288.41	0.0624	407.55	0.2168
179.47	0.0064	303.78	0.0735	411.13	0.2305
185.47	0.0079	316.68	0.0847	414.86	0.2448
190.16	0.0094	330.26	0.0958	417.48	0.2593
195.19	0.0109	341.64	0.1071	417.75	0.2756
198.84	0.0125	352.39	0.1184	420.37	0.2938

Table 57. Test data for specimen P22T–05

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 153.8 MPa	Ultimate Stress	: 399.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.55	0.0002	195.60	0.0136	338.12	0.1086
26.75	0.0002	200.36	0.0151	345.15	0.1180
50.06	0.0003	202.91	0.0164	353.84	0.1275
80.46	0.0005	206.08	0.0178	360.60	0.1370
113.97	0.0008	208.50	0.0191	366.46	0.1468
135.48	0.0016	224.91	0.0271	372.87	0.1567
150.17	0.0026	241.73	0.0362	377.35	0.1668
161.13	0.0038	256.90	0.0452	381.14	0.1773
168.58	0.0051	271.52	0.0542	386.73	0.1881
173.82	0.0065	283.86	0.0632	388.59	0.1993
180.64	0.0079	296.20	0.0723	391.83	0.2110
184.37	0.0094	307.78	0.0813	396.10	0.2236
189.47	0.0108	318.12	0.0904	397.48	0.2380
193.33	0.0122	328.33	0.0995	398.79	0.2563

Table 58. Test data for specimen P23A–15

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 161.0 MPa	Ultimate Stress	: 415.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
10.69	0.0002	61.78	0.0009	154.37	0.0079
12.41	0.0002	74.12	0.0011	156.58	0.0089
14.27	0.0002	89.01	0.0013	159.82	0.0099
15.38	0.0002	102.32	0.0015	161.61	0.0107
16.27	0.0002	113.63	0.0019	164.16	0.0117
17.37	0.0003	123.07	0.0024	166.92	0.0125
18.48	0.0003	131.07	0.0030	168.09	0.0134
19.72	0.0003	136.31	0.0037	170.37	0.0144
21.03	0.0003	141.00	0.0045	172.78	0.0152
25.65	0.0004	144.86	0.0053	174.44	0.0161
31.65	0.0004	148.51	0.0062	176.37	0.0171
39.85	0.0006	151.55	0.0071	178.51	0.0179
49.64	0.0007				

Table 59. Test data for specimen P23A–27

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 154.1 MPa	Ultimate Stress	: 419.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.99	0.0002	205.19	0.0138	359.35	0.1180
31.44	0.0002	207.60	0.0151	366.94	0.1275
63.57	0.0004	211.94	0.0164	374.11	0.1371
98.73	0.0006	215.05	0.0177	380.73	0.1469
121.69	0.0012	217.94	0.0190	387.76	0.1568
141.07	0.0020	234.15	0.0271	392.52	0.1668
154.03	0.0029	251.18	0.0361	396.72	0.1770
164.99	0.0039	266.07	0.0450	402.93	0.1875
172.51	0.0050	281.58	0.0542	406.38	0.1983
178.85	0.0062	296.13	0.0632	409.34	0.2094
185.47	0.0074	308.40	0.0721	413.34	0.2204
188.78	0.0086	319.64	0.0813	415.68	0.2333
194.98	0.0099	330.53	0.0902	417.62	0.2471
197.40	0.0112	340.74	0.0993	418.24	0.2568
200.91	0.0125	350.67	0.1086		

Table 60. Test data for specimen P22T–12

Test Number	: 066	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 167.0 MPa	Ultimate Stress	: 436.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
130.91	0.0009	268.41	0.0233	395.75	0.1236
153.22	0.0015	277.06	0.0282	399.34	0.1286
163.93	0.0019	285.77	0.0337	403.47	0.1335
174.58	0.0026	296.03	0.0405	407.24	0.1393
183.67	0.0034	304.54	0.0461	411.61	0.1450
195.59	0.0050	315.14	0.0538	414.86	0.1495
203.53	0.0058	320.76	0.0580	418.07	0.1533
211.42	0.0063	325.59	0.0620	421.65	0.1645
218.28	0.0069	333.05	0.0683	424.69	0.1706
224.89	0.0074	341.35	0.0749	428.54	0.1836
230.92	0.0080	350.28	0.0819	430.45	0.1904
239.05	0.0098	357.50	0.0881	432.49	0.1978
244.67	0.0121	365.29	0.0947	434.25	0.2047
253.04	0.0154	376.10	0.1022	435.40	0.2131
261.70	0.0198	387.44	0.1140	436.23	0.2183

Table 61. Test data for specimen P24A–30

Test Number	: 072	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 142.4 MPa	Ultimate Stress	: 432.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
131.1300	0.0010	256.7900	0.0283	375.0100	0.1331
140.8100	0.0014	260.6500	0.0311	381.8400	0.1423
150.2400	0.0020	264.3600	0.0336	389.1000	0.1534
157.8500	0.0025	269.0900	0.0375	395.7200	0.1641
164.8200	0.0033	273.1500	0.0401	400.1100	0.1726
178.3500	0.0056	283.6000	0.0478	404.0900	0.1813
184.0400	0.0069	289.0800	0.0517	408.2200	0.1913
190.3500	0.0091	294.0900	0.0561	412.8200	0.2031
196.1700	0.0115	301.9000	0.0625	416.9400	0.2131
204.0100	0.0131	314.8300	0.0730	420.8400	0.2262
209.8700	0.0140	327.0800	0.0861	422.4100	0.2322
220.8700	0.0158	334.2300	0.0925	426.1600	0.2507
228.2500	0.0170	341.9300	0.0989	428.3100	0.2628
233.0900	0.0180	345.6800	0.1004	430.0600	0.2746
239.4400	0.0202	361.3300	0.1163	431.4700	0.2825
251.7600	0.0252	364.5300	0.1201	432.1300	0.2978

Table 62. Test data for specimen P24A–33

Test Number	: 266	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 149.1 MPa	Ultimate Stress	: 425.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
40.469	0.0002	174.335	0.0071	377.208	0.1414
62.385	0.0002	191.185	0.0125	387.253	0.1546
72.151	0.0002	224.120	0.0276	391.765	0.1609
99.523	0.0004	228.372	0.0300	403.010	0.1784
107.616	0.0005	255.185	0.0450	404.316	0.1805
114.890	0.0005	274.007	0.0561	411.705	0.1958
120.765	0.0007	316.520	0.0848	415.330	0.2043
125.966	0.0009	324.415	0.0910	415.990	0.2064
134.208	0.0013	345.233	0.1085	422.545	0.2264
141.149	0.0018	347.565	0.1106	424.256	0.2331
169.298	0.0057	370.991	0.1344	425.780	0.2460

Table 63. Test data for specimen P24T–06

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 160.4 MPa	Ultimate Stress	: 447.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
40.40	0.0002	215.12	0.0125	371.63	0.1019
64.26	0.0004	219.32	0.0138	381.56	0.1110
90.32	0.0005	223.46	0.0151	389.90	0.1202
113.35	0.0008	226.98	0.0163	398.52	0.1296
131.69	0.0014	244.56	0.0239	405.83	0.1391
147.00	0.0021	263.10	0.0324	412.86	0.1488
160.37	0.0030	280.69	0.0409	420.37	0.1588
170.99	0.0040	297.03	0.0494	425.27	0.1691
180.99	0.0051	310.95	0.0580	430.23	0.1796
187.95	0.0062	324.88	0.6670	434.58	0.1905
192.85	0.0073	339.08	0.0754	439.06	0.2019
199.53	0.0086	349.70	0.0841	440.92	0.2138
204.71	0.0099	361.70	0.0930	443.82	0.2269
209.19	0.0112				

Table 64. Test data for specimen P24A–05

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Y	: 146.6 MPa	Ultimate Stress	: 430.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
56.54	0.0003	207.05	0.0169	365.42	0.1241
87.77	0.0006	212.70	0.0184	374.52	0.1340
115.07	0.0011	215.19	0.0198	381.62	0.1442
133.07	0.0020	218.22	0.0212	389.14	0.1546
146.58	0.0030	236.83	0.0300	395.07	0.1650
157.48	0.0041	255.45	0.0395	401.69	0.1757
166.30	0.0053	271.58	0.0489	406.79	0.1868
173.47	0.0066	287.24	0.0581	411.69	0.1980
180.37	0.0080	299.16	0.0673	416.37	0.2096
186.02	0.0095	312.95	0.0767	420.37	0.2218
190.09	0.0109	325.02	0.0860	423.34	0.2342
195.60	0.0124	336.46	0.0953	425.41	0.2470
200.15	0.0139	347.50	0.1048	427.75	0.2608
202.91	0.0154	357.42	0.1144	428.92	0.2753

Table 65. Test data for specimen 693–40

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 278.8 MPa	Ultimate Stress	: 606.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.62	0.0001	360.73	0.0266	562.20	0.3066
34.27	0.0002	389.00	0.0449	570.20	0.3265
73.77	0.0004	412.44	0.0630	573.02	0.3465
118.45	0.0007	433.40	0.0811	578.88	0.3669
143.34	0.0008	450.64	0.0991	583.23	0.3876
195.81	0.0012	464.64	0.1172	586.61	0.4084
219.46	0.0015	481.32	0.1356	590.95	0.4294
239.87	0.0020	492.84	0.1539	592.88	0.4509
258.35	0.0026	505.25	0.1725	597.02	0.4728
274.20	0.0034	515.11	0.1912	599.50	0.4952
288.27	0.0043	523.45	0.2099	600.88	0.5182
296.89	0.0053	532.07	0.2289	601.98	0.5421
305.85	0.0064	541.79	0.2480	605.98	0.5671
312.13	0.0075	551.17	0.2675	604.26	0.5947
316.95	0.0088	555.37	0.2869	580.26	0.6277

Table 66. Test data for specimen 693–41

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 273.4 MPa	Ultimate Stress	: 583.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.55	0.0001	316.12	0.0103	543.86	0.2884
63.98	0.0004	354.46	0.0275	546.89	0.3056
112.25	0.0006	380.66	0.0443	559.44	0.3421
136.86	0.0008	399.62	0.0609	564.06	0.3600
166.37	0.0010	418.79	0.0772	564.89	0.3780
192.78	0.0012	434.30	0.0935	567.44	0.3963
218.08	0.0016	448.71	0.1096	572.13	0.4150
241.52	0.0021	462.71	0.1258	572.47	0.4339
255.80	0.0028	472.98	0.1419	576.06	0.4531
273.38	0.0037	485.18	0.1581	578.61	0.4727
283.24	0.0046	492.63	0.1742	579.02	0.4830
294.06	0.0056	503.87	0.1903	580.54	0.5144
299.09	0.0067	511.45	0.2065	579.99	0.5383
305.78	0.0079	518.83	0.2227	530.90	0.5798
310.54	0.0091	532.07	0.2553		

Table 67. Test data for specimen 694–30

Test Number	: 213	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 253.6 MPa	Ultimate Stress	: 592.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.064	0.0001	304.492	0.0131	471.595	0.1353
28.651	0.0002	309.672	0.0149	486.665	0.1520
39.172	0.0003	325.290	0.0214	503.595	0.1729
83.755	0.0006	357.123	0.0389	511.477	0.1834
95.319	0.0007	370.342	0.0475	534.831	0.2191
106.981	0.0008	385.662	0.0581	546.581	0.2396
156.728	0.0013	417.769	0.0835	559.996	0.2673
168.547	0.0014	427.478	0.0919	569.543	0.2912
201.697	0.0020	442.337	0.1053	570.326	0.2934
211.739	0.0022	457.774	0.1206	585.602	0.3471
275.974	0.0063	469.930	0.1331	592.701	0.4041

Table 68. Test data for specimen 694–31

Test Number	: 214	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 264.1 MPa	Ultimate Stress	: 588.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.244	0.0001	353.863	0.0233	490.937	0.1322
30.299	0.0002	371.853	0.0323	508.542	0.1564
75.004	0.0004	376.140	0.0346	514.150	0.1651
86.479	0.0005	387.844	0.0413	529.756	0.1913
134.548	0.0008	391.394	0.0436	537.120	0.2055
146.345	0.0009	405.317	0.0527	538.046	0.2075
202.168	0.0015	424.102	0.0663	541.167	0.2142
266.385	0.0037	443.453	0.0823	557.456	0.2551
288.237	0.0056	453.475	0.0915	561.650	0.2671
293.641	0.0062	467.432	0.1053	574.865	0.3158
316.566	0.0103	477.244	0.1161	586.472	0.3843

Table 69. Test data for specimen 69–135

Test Number	: 212	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 244.7 MPa	Ultimate Stress	: 600.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.941	0.0001	373.098	0.0399	537.746	0.2300
28.372	0.0002	395.391	0.0539	559.708	0.2875
39.164	0.0003	401.251	0.0579	560.534	0.2896
82.127	0.0006	427.169	0.0780	561.166	0.2916
93.196	0.0007	443.763	0.0931	564.956	0.3041
162.694	0.0014	463.539	0.1132	567.920	0.3145
201.857	0.0022	488.281	0.1438	578.707	0.3584
244.583	0.0039	506.308	0.1703	581.234	0.3689
250.010	0.0042	514.908	0.1846	590.514	0.4220
286.788	0.0077	515.880	0.1867	599.746	0.5053
310.806	0.0127	522.828	0.1990	600.670	0.5351

Table 70. Test data for specimen 694–21

Test Number	: 129	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 286.7 MPa	Ultimate Stress	: 624.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	337.70	0.0100	516.64	0.1202
25.29	0.0001	355.85	0.0139	540.48	0.1493
25.78	0.0001	375.32	0.0230	563.50	0.1909
202.11	0.0028	401.68	0.0314	562.73	0.1925
220.67	0.0031	423.52	0.0439	587.68	0.2523
220.47	0.0032	456.54	0.0688	609.91	0.3300
278.46	0.0047	478.25	0.0847	624.63	0.4169
314.64	0.0073	492.58	0.0976		

Table 71. Test data for specimen 694–25

Test Number	: 138	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 232.1 MPa	Ultimate Stress	: 585.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	345.97	0.0272	489.97	0.1759
63.76	0.0002	367.11	0.0422	511.55	0.2187
196.90	0.0020	391.60	0.0609	528.74	0.2605
216.59	0.0026	423.07	0.0910	559.66	0.3535
270.79	0.0047	458.08	0.1248	578.29	0.4746
286.44	0.0066	478.44	0.1529	578.29	0.4747
310.53	0.0112	483.92	0.1637	585.42	0.5537
329.69	0.0183				

Table 72. Test data for specimen 692–40

Test Number	: 169	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 289.6 MPa	Ultimate Stress	: 622.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	359.36	0.0145	519.97	0.1109
167.41	0.0011	380.55	0.0207	549.61	0.1450
259.45	0.0032	416.48	0.0366	587.78	0.2024
296.75	0.0050	464.10	0.0662	606.17	0.2396
318.41	0.0069	488.56	0.0849	624.50	0.3420
336.94	0.0094				

Table 73. Test data for specimen 692–41

Test Number	: 158	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 269.4 MPa	Ultimate Stress	: 604.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	360.37	0.0128	490.75	0.0851
216.85	0.0011	375.03	0.0172	500.69	0.0948
249.30	0.0017	395.81	0.0250	542.63	0.1332
281.66	0.0029	410.58	0.0325	571.23	0.1713
302.70	0.0058	436.92	0.0470	591.06	0.2121
312.62	0.0049	454.19	0.0585	603.15	0.2525
323.14	0.0060	470.45	0.0702	604.40	0.2857
342.94	0.0091				

Table 74. Test data for specimen 69–245

Test Number	: 160	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 272.5 MPa	Ultimate Stress	: 485.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	341.82	0.0144	450.74	0.0793
124.00	0.0006	360.03	0.0205	469.20	0.0961
250.85	0.0030	381.06	0.0299	480.46	0.1091
292.97	0.0059	394.62	0.0379	483.88	0.1156
314.66	0.0086	409.01	0.0475	485.82	0.1185
330.39	0.0113	426.91	0.0601		

Table 75. Test data for specimen 691–28

Test Number	: 290	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 291.6 MPa	Ultimate Stress	: 637.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.217	0.0001	285.141	0.0031	513.943	0.0884
49.211	0.0002	291.618	0.0034	529.028	0.1031
59.313	0.0003	319.590	0.0049	531.148	0.1053
103.425	0.0005	327.870	0.0055	549.125	0.1258
114.924	0.0005	371.732	0.0111	559.101	0.1388
126.683	0.0006	438.943	0.0350	560.643	0.1410
197.707	0.0011	442.567	0.0370	572.643	0.1583
208.454	0.0012	469.498	0.0532	603.488	0.2156
218.725	0.0013	472.467	0.0553	610.958	0.2338
263.449	0.0023	489.364	0.0676	623.247	0.2704
271.030	0.0026	492.111	0.0697	635.055	0.3245

Table 76. Test data for specimen 691–29

Test Number	: 291	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 287.7 MPa	Ultimate Stress	: 650.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
18.324	0.0001	299.056	0.0040	549.087	0.1246
32.816	0.0001	304.902	0.0043	562.486	0.1418
64.389	0.0003	342.600	0.0072	571.594	0.1548
74.794	0.0003	354.210	0.0087	585.186	0.1767
110.034	0.0005	382.322	0.0140	591.499	0.1877
133.886	0.0006	393.706	0.0172	606.777	0.2188
181.445	0.0009	448.784	0.0407	611.645	0.2300
192.641	0.0010	475.489	0.0572	620.031	0.2518
203.393	0.0012	495.205	0.0718	638.007	0.3117
249.839	0.0021	510.290	0.0844	640.658	0.3235
258.027	0.0024	528.122	0.1013	650.490	0.3993

Table 77. Test data for specimen 69–230

Test Number	: 292	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 298.8 MPa	Ultimate Stress	: 669.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.574	0.0001	401.408	0.0192	550.954	0.1236
67.134	0.0004	407.220	0.0213	567.002	0.1424
78.055	0.0004	431.264	0.0317	578.039	0.1570
89.323	0.0005	435.510	0.0338	595.389	0.1823
174.631	0.0011	447.375	0.0401	601.702	0.1929
186.713	0.0012	461.207	0.0484	615.293	0.2182
230.179	0.0018	471.063	0.0547	623.245	0.2351
295.588	0.0037	486.085	0.0651	633.992	0.2607
301.988	0.0040	505.073	0.0797	649.511	0.3080
390.983	0.0158	526.230	0.0984	652.450	0.3190
396.420	0.0175	537.074	0.1088	669.415	0.4275

Table 78. Test data for specimen 692–25

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 285.4 MPa	Ultimate Stress	: 633.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
17.03	0.0002	315.99	0.0060	575.44	0.2356
30.96	0.0003	326.54	0.0069	582.26	0.2567
48.61	0.0003	332.19	0.0078	588.74	0.2782
69.15	0.0004	337.15	0.0088	597.09	0.2997
93.77	0.0006	397.28	0.0281	600.95	0.3215
116.52	0.0007	430.58	0.0488	606.33	0.3434
143.89	0.0009	457.81	0.0694	611.70	0.3655
168.58	0.0011	479.94	0.0899	615.43	0.3878
195.19	0.0014	501.25	0.1105	617.98	0.4106
222.70	0.0018	516.14	0.1311	622.18	0.4338
243.38	0.0023	529.10	0.1518	624.67	0.4572
262.97	0.0029	543.65	0.1725	625.91	0.4813
279.79	0.0035	553.92	0.1934	629.35	0.5058
292.96	0.0043	565.85	0.2145	631.01	0.5310
305.92	0.0051				

Table 79. Test data for specimen 692–26

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570
Yield Stress	: 302.6 MPa	Ultimate Stress	: 648.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
56.26	0.0002	342.05	0.0068	599.71	0.2514
77.77	0.0003	348.46	0.0077	607.43	0.2711
100.32	0.0005	403.96	0.0252	612.39	0.2911
126.93	0.0006	438.30	0.0441	619.15	0.3113
156.37	0.0007	464.91	0.0628	624.46	0.3319
184.30	0.0009	489.53	0.0815	629.08	0.3527
209.12	0.0012	506.42	0.1000	631.01	0.3740
235.18	0.0015	522.69	0.1187	635.49	0.3957
252.90	0.0019	536.21	0.1374	639.28	0.4179
273.31	0.0024	550.96	0.1561	641.76	0.4405
288.48	0.0030	561.85	0.1749	643.97	0.4642
302.61	0.0036	573.92	0.1938	643.83	0.4884
317.09	0.0043	582.26	0.2128	693.74	0.5142
326.33	0.0051	591.71	0.2320	693.51	0.5423
334.60	0.0059				

Table 80. Test data for specimen 694–06

Test Number	: 130	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 292.1 MPa	Ultimate Stress	: 652.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	424.24	0.0347	586.25	0.1890
52.67	0.0002	446.83	0.0477	598.94	0.2068
205.14	0.0024	472.38	0.0649	613.91	0.2894
300.54	0.0049	479.82	0.0705	627.40	0.2075
333.72	0.0076	490.91	0.0808	635.87	0.3284
352.83	0.0102	516.46	0.0999	643.32	0.3695
374.54	0.0151	539.41	0.1211	651.98	0.4355
397.47	0.0223	567.83	0.1593	652.00	0.4794
397.98	0.0225				

Table 81. Test data for specimen 694–07

Test Number	: 131	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 266.2 MPa	Ultimate Stress	: 635.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	351.64	0.0125	522.00	0.1168
48.83	0.0000	375.73	0.0192	521.61	0.1170
190.46	0.0014	394.91	0.0266	546.67	0.1430
205.90	0.0019	413.76	0.0361	575.73	0.1892
219.80	0.0021	432.19	0.0471	600.01	0.2344
224.58	0.0021	457.56	0.0635	616.14	0.2782
282.30	0.0038	479.87	0.0794	625.95	0.3272
311.61	0.0063	490.93	0.0897	635.48	0.3858
336.66	0.0096				

Table 82. Test data for specimen 694–08

Test Number	: 224	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 246.8 MPa	Ultimate Stress	: 619.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
29.804	0.0001	251.978	0.0037	489.372	0.1201
57.140	0.0003	257.323	0.0040	505.084	0.1375
69.410	0.0003	290.110	0.0073	529.567	0.1677
114.844	0.0006	295.546	0.0081	540.362	0.1829
126.319	0.0007	300.549	0.0090	580.171	0.2557
139.722	0.0008	323.287	0.0140	584.943	0.2668
151.033	0.0009	356.050	0.0254	600.606	0.3117
193.474	0.0015	383.049	0.0383	609.329	0.3458
202.824	0.0016	387.059	0.0405	615.161	0.3782
211.624	0.0019	428.034	0.0664	615.547	0.3805
246.493	0.0033	450.503	0.0840	619.932	0.4381

Table 83. Test data for specimen 69–119

Test Number	: 134	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 249.6 MPa	Ultimate Stress	: 617.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.15	0.0000	371.71	0.0220	517.93	0.1238
61.59	0.0002	398.15	0.0329	540.92	0.1492
198.49	0.0023	418.93	0.0460	567.66	0.1938
212.81	0.0025	443.63	0.0641	584.92	0.2359
288.30	0.0051	468.44	0.0800	602.70	0.3007
318.24	0.0090	474.73	0.0861	605.60	0.2987
338.72	0.0117	475.41	0.0858	617.30	0.3745
358.66	0.0183	487.14	0.0970		

Table 84. Test data for specimen 693–12

Test Number	: 194	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 270.9 MPa	Ultimate Stress	: 674.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
12.191	0.0001	302.570	0.0057	598.040	0.1585
56.631	0.0005	311.152	0.0063	599.509	0.1606
78.604	0.0006	319.010	0.0070	627.808	0.2077
89.895	0.0007	354.996	0.0113	647.783	0.2552
149.801	0.0011	372.959	0.0147	648.713	0.2574
161.836	0.0012	423.485	0.0298	652.826	0.2706
173.532	0.0013	428.640	0.0318	659.240	0.2929
184.754	0.0015	502.373	0.0696	662.863	0.3086
240.357	0.0027	550.452	0.1062	663.205	0.3109
247.857	0.0030	579.534	0.1354	666.143	0.3245
292.043	0.0050	584.919	0.1417	673.683	0.4037

Table 85. Test data for specimen 693–13

Test Number	: 195	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 259.2 MPa	Ultimate Stress	: 655.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.518	0.0001	306.978	0.0074	557.880	0.1354
29.428	0.0002	341.770	0.0124	583.972	0.1679
39.967	0.0003	352.485	0.0145	593.580	0.1824
82.031	0.0006	358.620	0.0160	603.382	0.1991
92.775	0.0007	392.335	0.0267	615.038	0.2223
103.705	0.0008	413.189	0.0350	622.500	0.2394
183.741	0.0016	451.464	0.0536	629.231	0.2582
193.934	0.0017	482.282	0.0718	630.157	0.2604
242.138	0.0030	501.307	0.0850	641.667	0.2995
284.841	0.0054	523.790	0.1026	642.155	0.3017
292.874	0.0060	545.883	0.1229	649.860	0.3381

Table 86. Test data for specimen 69–130

Test Number	: 196	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 258.4 MPa	Ultimate Stress	: 661.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
13.002	0.0001	527.036	0.1119	628.924	0.2825
56.794	0.0005	544.148	0.1288	632.775	0.2970
67.314	0.0006	548.340	0.1335	635.798	0.3095
125.726	0.0009	594.653	0.1979	641.355	0.3369
231.806	0.0023	596.846	0.2019	642.135	0.3390
276.315	0.0043	601.234	0.2105	644.280	0.3541
334.991	0.0091	607.815	0.2248	646.961	0.3694
370.451	0.0159	612.739	0.2358	648.424	0.3825
397.157	0.0254	617.468	0.2479	652.275	0.4205
407.375	0.0300	618.930	0.2519	653.543	0.4434
511.631	0.0982	627.608	0.2784	654.566	0.4810

Table 87. Test data for specimen 692–16

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 253.6 MPa	Ultimate Stress	: 638.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
5.35	0.0003	308.82	0.0080	579.50	0.2027
57.02	0.0004	318.06	0.0091	589.16	0.2191
78.12	0.0005	323.50	0.0101	595.98	0.2352
102.04	0.0006	378.80	0.0250	601.84	0.2514
123.90	0.0007	416.99	0.0412	609.01	0.2676
148.65	0.0009	444.57	0.0573	614.05	0.2839
174.09	0.0011	468.36	0.0734	618.46	0.3000
198.84	0.0015	487.87	0.0893	621.91	0.3161
218.70	0.0020	507.11	0.1054	624.39	0.3320
237.52	0.0027	521.86	0.1215	629.15	0.3478
253.59	0.0035	538.69	0.1377	632.04	0.3634
268.21	0.0043	551.51	0.1540	635.15	0.3787
279.93	0.0052	560.61	0.1702	635.83	0.3935
291.37	0.0061	571.30	0.1865	636.52	0.4076
300.20	0.0070				

Table 88. Test data for specimen 692–17

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570
Yield Stress	: 300.9 MPa	Ultimate Stress	: 683.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
37.16	0.0002	338.33	0.0061	619.98	0.1643
57.09	0.0003	347.08	0.0070	630.73	0.1774
77.36	0.0004	356.18	0.0080	637.28	0.1907
98.80	0.0005	409.76	0.0198	643.56	0.2042
124.24	0.0006	446.57	0.0330	650.45	0.2178
147.75	0.0007	474.22	0.0459	658.38	0.2318
174.71	0.0009	497.53	0.0586	661.48	0.2462
201.88	0.0011	520.07	0.0714	665.83	0.2608
226.35	0.0014	538.83	0.0840	670.86	0.2761
249.93	0.0017	554.82	0.0967	673.62	0.2915
267.38	0.0022	571.30	0.1093	676.38	0.3074
285.93	0.0028	584.88	0.1221	677.89	0.3253
300.89	0.0036	597.22	0.1397	680.72	0.3420
315.57	0.0043	607.08	0.1517	681.41	0.3592
325.98	0.0051				

Table 89. Test data for specimen 692-15

Test Number	: 132	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 287.8 MPa	Ultimate Stress	: 673.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	402.17	0.0234	588.75	0.1456
48.36	0.0003	422.54	0.0303	614.28	0.1803
204.28	0.0028	440.75	0.0392	637.49	0.2198
220.26	0.0030	459.56	0.0486	639.37	0.2202
280.31	0.0050	474.81	0.0582	656.16	0.2726
310.80	0.0067	484.83	0.0662	669.09	0.3230
336.12	0.0089	522.63	0.0900	673.06	0.3595
356.52	0.0123	554.65	0.1125	673.92	0.3920
380.47	0.0170				

Table 90. Test data for specimen 692–22

Test Number	: 133	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 278.6 MPa	Ultimate Stress	: 699.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	436.88	0.0271	623.56	0.1674
38.38	0.0003	463.13	0.0381	640.99	0.1934
208.64	0.0027	478.68	0.0460	659.25	0.2328
221.35	0.0030	490.47	0.0543	671.26	0.2732
307.54	0.0057	532.36	0.0824	690.36	0.3315
360.78	0.0101	561.09	0.0998	697.69	0.3936
395.49	0.0154	585.36	0.1218	699.13	0.4474
417.65	0.0208	597.45	0.1338		

Table 91. Test data for specimen 692–23

Test Number	: 230	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 260.5 MPa	Ultimate Stress	: 664.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
33.299	0.0002	338.892	0.0101	586.626	0.1587
49.029	0.0003	361.067	0.0140	589.529	0.1629
74.030	0.0004	393.989	0.0228	599.642	0.1780
85.676	0.0005	454.954	0.0488	611.060	0.1975
147.160	0.0009	458.695	0.0508	618.851	0.2128
159.290	0.0010	486.807	0.0673	627.753	0.2327
171.333	0.0011	516.370	0.0877	633.076	0.2460
245.169	0.0028	536.450	0.1042	642.172	0.2731
252.088	0.0031	543.418	0.1104	657.656	0.3407
277.017	0.0044	564.078	0.1313	661.188	0.3663
287.836	0.0051	578.449	0.1481	664.043	0.4000

Table 92. Test data for specimen 69–109

Test Number	: 135	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 276.7 MPa	Ultimate Stress	: 688.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	431.75	0.0220	627.12	0.2021
43.64	0.0003	461.67	0.0470	651.41	0.2642
203.61	0.0031	479.14	0.0574	665.36	0.3196
305.80	0.0065	492.48	0.0667	674.17	0.3623
344.05	0.0100	542.45	0.0988	678.09	0.3952
377.06	0.0149	573.46	0.1271	685.21	0.4499
405.86	0.0221	601.41	0.1597	688.02	0.5581

Table 93. Test data for specimen 691–04

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 271.3 MPa	Ultimate Stress	: 691.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
37.58	0.0000	325.78	0.0068	606.46	0.1622
54.19	0.0003	387.69	0.0158	615.01	0.1738
73.43	0.0004	424.23	0.0267	622.60	0.1854
94.80	0.0005	452.99	0.0378	629.22	0.1970
118.73	0.0006	475.26	0.0489	632.39	0.2085
143.20	0.0007	494.56	0.0601	641.35	0.2203
169.47	0.0010	514.14	0.0712	646.73	0.2322
192.98	0.0012	530.69	0.0824	649.56	0.2442
213.46	0.0016	199.67	0.0728	656.59	0.2559
233.87	0.0021	543.38	0.0936	658.59	0.2669
251.66	0.0026	558.75	0.1049	663.48	0.2779
266.55	0.0032	571.30	0.1162	666.65	0.2894
282.06	0.0039	579.78	0.1278	97.19	0.3008
294.13	0.0045	589.57	0.1392	97.74	0.3109
305.78	0.0053	599.02	0.1507	97.83	0.3197
316.47	0.0060				

Table 94. Test data for specimen 691–05

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570
Yield Stress	: 263.1 MPa	Ultimate Stress	: 664.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
2.86	0.0000	307.37	0.0058	612.53	0.2132
5.20	0.0002	315.02	0.0065	620.25	0.2318
55.09	0.0003	324.54	0.0073	628.25	0.2505
76.95	0.0004	334.19	0.0081	634.18	0.2695
101.77	0.0004	402.17	0.0217	639.97	0.2886
126.52	0.0006	441.68	0.0379	643.69	0.3080
150.65	0.0007	470.22	0.0547	647.42	0.3275
173.95	0.0009	496.84	0.0718	652.11	0.3474
197.33	0.0013	518.07	0.0890	655.55	0.3674
216.77	0.0017	539.38	0.1064	657.69	0.3880
236.83	0.0023	554.61	0.1238	659.83	0.4089
253.66	0.0029	569.02	0.1414	660.10	0.4303
269.59	0.0036	582.06	0.1591	661.00	0.4525
281.17	0.0042	594.60	0.1770	662.10	0.4761
296.13	0.0050	603.36	0.1950		

Table 95. Test data for specimen 693–42

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 190.8 MPa	Ultimate Stress	: 420.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
38.40	0.0002	221.11	0.0099	367.35	0.1210
62.81	0.0003	223.25	0.0111	374.66	0.1298
88.25	0.0004	225.67	0.0122	382.25	0.1407
116.38	0.0006	244.35	0.0204	386.04	0.1510
143.76	0.0009	261.66	0.0296	391.14	0.1606
162.03	0.0013	277.17	0.0386	397.69	0.1704
175.33	0.0019	290.34	0.0477	399.96	0.1792
186.50	0.0026	304.27	0.0568	402.38	0.1917
193.74	0.0035	315.50	0.0658	409.00	0.1998
201.60	0.0045	327.29	0.0748	409.76	0.2107
206.22	0.0055	337.84	0.0837	410.17	0.2202
209.95	0.0066	346.88	0.0928	412.10	0.2340
213.19	0.0076	352.87	0.1024	415.00	0.2410
217.87	0.0088	360.66	0.1113	416.31	0.2581

Table 96. Test data for specimen 694–40

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 177.0 MPa	Ultimate Stress	: 417.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
5.84	0.0002	217.12	0.0120	364.80	0.1259
62.05	0.0003	217.46	0.0134	369.70	0.1357
86.12	0.0003	223.11	0.0143	380.18	0.1476
110.25	0.0006	224.91	0.0156	382.38	0.1598
130.59	0.0009	242.97	0.0248	388.52	0.1707
148.72	0.0014	262.83	0.0351	393.48	0.1830
166.03	0.0021	278.69	0.0451	399.62	0.1924
178.92	0.0030	293.30	0.0551	402.03	0.2047
188.50	0.0040	306.13	0.0652	405.20	0.2206
195.74	0.0051	318.88	0.0753	407.48	0.2323
198.71	0.0065	330.60	0.0853	409.20	0.2450
206.43	0.0078	338.12	0.0950	411.55	0.2557
206.77	0.0093	347.43	0.1052	411.13	0.2715
214.22	0.0106	356.46	0.1155	413.62	0.2897

Table 97. Test data for specimen 694–32

Test Number	: 255	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 176.8 MPa	Ultimate Stress	: 401.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
92.1209	0.0003	196.3262	0.0070	335.6876	0.0945
101.7914	0.0004	201.4223	0.0085	365.2161	0.1293
112.1934	0.0005	207.0842	0.0108	368.0202	0.1315
131.3247	0.0006	243.0889	0.0287	379.9242	0.1488
147.5982	0.0008	255.0904	0.0352	378.3051	0.1510
154.0403	0.0012	258.7821	0.0373	388.0293	0.1683
159.5851	0.0014	266.2142	0.0419	391.2138	0.1726
167.7292	0.0019	289.8515	0.0572	397.4559	0.1860
174.1713	0.0024	305.3058	0.0684	395.7735	0.1931
190.5912	0.0054	313.5523	0.0748	400.2844	0.2048
		326.3536	0.0858	401.8791	0.2168

Table 98. Test data for specimen 694-33

Test Number	: 256	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 173.0 MPa	Ultimate Stress	: 386.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
40.677	0.0002	183.059	0.0043	311.235	0.0687
77.338	0.0001	188.797	0.0053	314.099	0.0708
86.362	0.0002	193.883	0.0065	327.536	0.0815
105.077	0.0003	199.723	0.0080	346.024	0.0987
114.923	0.0005	205.021	0.0097	355.618	0.1093
139.343	0.0007	210.938	0.0119	366.011	0.1221
145.909	0.0011	221.791	0.0164	370.124	0.1287
151.739	0.0012	231.511	0.0210	375.045	0.1351
156.810	0.0015	264.427	0.0384	377.498	0.1415
164.711	0.0020	279.195	0.0470	385.428	0.1618
176.450	0.0031	296.023	0.0579	386.580	0.1705

Table 99. Test data for specimen 69-236

Test Number	: 254	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 194.1 MPa	Ultimate Stress	: 440.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
29.931	0.0002	260.447	0.0256	402.820	0.1400
128.317	0.0004	278.262	0.0348	416.634	0.1681
153.637	0.0006	293.774	0.0434	422.237	0.1748
160.551	0.0008	314.841	0.0562	427.859	0.1856
177.960	0.0015	327.460	0.0649	427.540	0.1966
185.697	0.0019	336.252	0.0711	428.628	0.1989
191.963	0.0026	354.730	0.0862	430.196	0.2013
208.602	0.0053	368.481	0.0989	435.668	0.2148
214.752	0.0069	379.193	0.1098	438.387	0.2264
220.210	0.0085	393.975	0.1292	437.134	0.2355
236.327	0.0145	395.983	0.1313	437.841	0.2444

Table 100. Test data for specimen 694–26

Test Number	: 093	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 174.4 MPa	Ultimate Stress	: 408.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
138.84	0.0010	265.70	0.0209	356.35	0.0886
160.95	0.0016	269.89	0.0232	359.43	0.0914
167.45	0.0019	274.99	0.0261	368.11	0.0972
173.71	0.0021	278.60	0.0284	370.90	0.1000
179.57	0.0025	283.15	0.0313	378.15	0.1079
185.44	0.0030	291.95	0.0367	380.44	0.1108
197.02	0.0044	299.03	0.0418	388.90	0.1219
207.49	0.0053	303.34	0.0449	394.34	0.1299
217.36	0.0060	307.25	0.0478	396.33	0.1330
227.69	0.0070	312.20	0.0518	399.83	0.1394
236.43	0.0083	323.14	0.0601	401.68	0.1426
242.41	0.0101	332.16	0.0677	404.39	0.1490
248.98	0.0127	335.03	0.0702	405.75	0.1522
252.15	0.0140	344.10	0.0777	406.52	0.1557
257.29	0.0163	346.68	0.0800	407.38	0.1584
260.90	0.0183	353.77	0.0861	408.66	0.1643

Table 101. Test data for specimen 694–27

Test Number	: 094	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 183.5 MPa	Ultimate Stress	: 422.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
146.2500	0.0011	272.5800	0.0190	382.9700	0.0966
165.8300	0.0016	276.2900	0.0207	391.2300	0.1026
192.3000	0.0030	289.1900	0.0275	398.8000	0.1111
204.5200	0.0039	293.6400	0.0300	406.0500	0.1209
217.7800	0.0045	303.1800	0.0355	410.6100	0.1286
224.7300	0.0050	311.4900	0.0408	412.9100	0.1319
235.6900	0.0060	464.0200	0.0456	416.2700	0.1375
241.1200	0.0070	326.2900	0.0506	418.5200	0.1408
246.4500	0.0087	334.9000	0.0571	419.8900	0.1488
252.7700	0.0108	342.1100	0.0623	420.7900	0.1547
257.1700	0.0124	348.4300	0.0671	421.5300	0.1583
261.1700	0.0139	355.2700	0.0726	422.4500	0.1621
265.0200	0.0155	365.4400	0.0809	422.8100	0.1716
268.6800	0.0172	375.4200	0.0895		

Table 102. Test data for specimen 692–42

Test Number	: 173	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 178.5 MPa	Ultimate Stress	: 423.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	220.77	0.0069	328.14	0.0550
32.82	0.0000	225.25	0.0079	335.92	0.0603
87.60	0.0003	232.51	0.0096	343.22	0.0654
122.11	0.0007	244.00	0.0129	356.66	0.0752
147.65	0.0012	246.99	0.0140	365.52	0.0821
166.30	0.0017	251.47	0.0153	373.47	0.0883
174.93	0.0020	255.50	0.0169	380.38	0.0937
178.85	0.0022	259.44	0.0185	383.34	0.0965
187.88	0.0027	264.02	0.0202	389.76	0.1002
194.33	0.0033	279.22	0.0272	398.90	0.1098
198.16	0.0037	289.34	0.0326	406.36	0.1197
202.33	0.0041	297.11	0.0367	412.27	0.1287
208.24	0.0049	310.43	0.0442	416.28	0.1365
213.17	0.0056	319.00	0.0493	420.05	0.1444
215.60	0.0060	321.95	0.0514	423.15	0.1633

Table 103. Test data for specimen 694–39

Test Number	: 179	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 168.2 MPa	Ultimate Stress	: 413.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	221.61	0.0109	342.46	0.0788
38.24	0.0000	225.99	0.0124	356.38	0.0897
77.18	0.0003	230.03	0.0137	362.54	0.0945
118.92	0.0009	233.81	0.0153	370.79	0.0999
142.34	0.0014	242.89	0.0185	377.89	0.1069
154.72	0.0018	246.67	0.0203	386.27	0.1162
166.44	0.0024	255.09	0.0238	391.19	0.1222
177.42	0.0031	263.06	0.0277	399.65	0.1348
183.21	0.0037	267.79	0.0302	403.16	0.1411
188.10	0.0043	275.61	0.0344	406.77	0.1481
197.17	0.0055	281.19	0.0374	409.33	0.1544
202.51	0.0065	286.87	0.0411	411.89	0.1614
207.90	0.0076	301.45	0.0499	413.02	0.1666
212.68	0.0085	311.21	0.0560	413.54	0.1712
217.02	0.0096	328.38	0.0683	413.84	0.1796

Table 104. Test data for specimen 69–246

Test Number	: 180	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 165.5 MPa	Ultimate Stress	: 423.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	226.65	0.0109	333.06	0.0719
38.39	0.0000	233.55	0.0131	336.77	0.0751
88.32	0.0003	241.50	0.0160	342.78	0.0801
125.36	0.0008	251.71	0.0205	353.04	0.0882
151.10	0.0014	263.56	0.0261	366.00	0.0976
164.85	0.0020	273.17	0.0310	380.33	0.1127
175.80	0.0025	281.62	0.0363	388.44	0.1227
184.49	0.0031	285.82	0.0389	397.96	0.1349
190.74	0.0036	291.13	0.0422	402.18	0.1416
198.19	0.0045	300.58	0.0482	408.70	0.1540
203.84	0.0054	304.64	0.0512	412.71	0.1631
210.14	0.0065	307.84	0.0535	418.09	0.1773
212.44	0.0070	312.19	0.0568	419.24	0.1818
216.34	0.0080	318.80	0.0616	422.96	0.1947
220.29	0.0091	322.65	0.0645	423.02	0.1987

Table 105. Test data for specimen 692–28

Test Number	: 322	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 209.1 MPa	Ultimate Stress	: 462.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
40.830	0.0001	231.050	0.0052	404.400	0.0993
107.640	0.0002	248.300	0.0089	422.080	0.1191
118.020	0.0003	253.150	0.0102	430.380	0.1302
127.670	0.0004	274.850	0.0178	437.620	0.1412
153.380	0.0006	300.340	0.0291	442.680	0.1501
161.060	0.0007	318.020	0.0380	448.180	0.1612
168.070	0.0009	337.670	0.0490	452.890	0.1724
187.220	0.0016	348.550	0.0556	453.660	0.1746
197.770	0.0020	368.160	0.0687	456.090	0.1812
220.280	0.0038	382.460	0.0795	459.530	0.1923
225.950	0.0044	387.760	0.0839	462.410	0.2119

Table 106. Test data for specimen 692–29

Test Number	: 323	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 212.3 MPa	Ultimate Stress	: 464.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.50	0.0001	313.79	0.0358	436.19	0.1390
52.59	0.0002	330.08	0.0447	441.32	0.1479
107.64	0.0002	348.55	0.0556	442.68	0.1501
153.38	0.0006	355.38	0.0598	447.10	0.1590
187.22	0.0016	368.16	0.0687	449.08	0.1634
197.77	0.0020	374.18	0.0730	452.89	0.1724
220.28	0.0038	382.46	0.0795	453.66	0.1746
225.95	0.0044	387.76	0.0839	456.09	0.1812
231.05	0.0052	395.23	0.0905	456.81	0.1835
248.30	0.0089	404.40	0.0993	459.07	0.1901
253.15	0.0102	412.71	0.1081	459.53	0.1923
269.03	0.0155	414.79	0.1102	461.46	0.2002
274.85	0.0178	422.08	0.1191	461.52	0.2026
290.71	0.0246	423.95	0.1212	462.28	0.2096
300.34	0.0291	430.38	0.1302	462.41	0.2119

Table 107. Test data for specimen 69–130

Test Number	: 321	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 209.1 MPa	Ultimate Stress	: 468.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.9900	0.0001	297.9800	0.0256	442.2700	0.1422
51.6000	0.0002	316.5400	0.0345	444.7000	0.1465
82.8700	0.0003	329.1100	0.0410	448.3000	0.1534
137.9900	0.0007	348.1400	0.0519	450.4400	0.1577
164.9200	0.0011	361.8000	0.0606	451.5000	0.1599
193.2100	0.0019	368.2400	0.0650	453.4500	0.1644
199.1900	0.0021	380.1900	0.0738	456.9800	0.1734
204.5900	0.0025	391.1000	0.0825	457.7800	0.1757
224.7700	0.0042	396.1400	0.0870	460.0000	0.1824
236.0400	0.0056	398.6300	0.0891	461.3400	0.1870
242.8700	0.0067	405.5600	0.0956	462.8300	0.1937
260.3900	0.0111	414.1800	0.1044	463.0500	0.1957
266.0500	0.0127	427.2600	0.1198	464.1600	0.2028
271.3400	0.0146	433.7100	0.1288	464.3300	0.2052
287.6800	0.0210	436.8000	0.1332		

Table 108. Test data for specimen 692–27

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 173.1 MPa	Ultimate Stress	: 451.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
30.96	0.0002	218.91	0.0095	396.24	0.1123
53.09	0.0003	224.15	0.0107	402.79	0.1220
78.81	0.0005	229.60	0.0118	411.62	0.1316
100.80	0.0006	230.77	0.0129	418.44	0.1416
122.04	0.0010	254.55	0.0213	420.92	0.1519
139.62	0.0015	276.89	0.0305	426.30	0.1607
154.79	0.0021	295.79	0.0395	433.68	0.1711
168.65	0.0027	312.68	0.0485	435.96	0.1819
180.44	0.0035	328.95	0.0574	437.47	0.1949
191.47	0.0044	341.84	0.0663	443.26	0.2042
198.29	0.0054	354.46	0.0754	444.16	0.2147
204.36	0.0064	366.53	0.0844	445.40	0.2278
209.81	0.0074	376.66	0.0936	448.23	0.2386
214.98	0.0084	386.52	0.1029		

Table 109. Test data for specimen 694–09

Test Number	: 084	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 156.4 MPa	Ultimate Stress	: 413.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
123.82	0.0008	285.16	0.0396	384.24	0.1428
135.09	0.0011	288.91	0.0425	388.55	0.1516
145.72	0.0014	292.03	0.0451	392.78	0.1621
179.65	0.0034	297.24	0.0497	396.40	0.1704
184.07	0.0039	318.71	0.0680	399.99	0.1807
187.95	0.0044	322.01	0.0713	402.35	0.1886
197.82	0.0059	328.13	0.0044	404.54	0.1971
209.48	0.0070	331.83	0.0064	405.67	0.2006
250.46	0.0161	334.79	0.0835	410.36	0.2219
254.22	0.0183	342.03	0.0902	410.65	0.2254
257.59	0.0205	351.67	0.0984	411.35	0.2291
261.58	0.0233	354.18	0.1012	411.80	0.2324
264.56	0.0251	362.98	0.1120	412.14	0.2359
271.69	0.0300	368.77	0.1199	413.13	0.2504
278.33	0.0344	370.36	0.1223		

Table 110. Test data for specimen 69–120

Test Number	: 085	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 179.8 MPa	Ultimate Stress	: 429.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
136.20	0.0012	280.83	0.0234	384.06	0.0967
155.69	0.0017	288.57	0.0269	386.73	0.0978
163.40	0.0020	292.45	0.0293	388.24	0.0997
169.57	0.0023	300.51	0.0341	394.84	0.1057
181.02	0.0028	321.25	0.0472	400.41	0.1116
190.90	0.0035	327.47	0.0516	404.27	0.1186
200.80	0.0042	332.17	0.0563	406.32	0.1205
213.12	0.0047	336.71	0.0598	417.53	0.1375
223.46	0.0051	341.63	0.0630	418.61	0.1406
233.17	0.0058	347.16	0.0666	423.94	0.1475
237.09	0.0064	352.21	0.0711	424.93	0.1505
241.80	0.0075	357.79	0.0753	426.86	0.1582
245.58	0.0089	359.94	0.0773	427.76	0.1623
268.51	0.0176	374.46	0.0886	428.79	0.1649
272.59	0.0200	379.16	0.0925	429.62	0.1680

Table 111. Test data for specimen 693–14

Test Number	: 243	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 186.4 MPa	Ultimate Stress	: 457.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
41.930	0.0002	222.230	0.0082	340.870	0.0606
44.020	0.0002	227.610	0.0095	358.140	0.0714
72.230	0.0002	232.580	0.0110	367.790	0.0779
82.970	0.0002	254.330	0.0181	370.810	0.0800
104.380	0.0003	265.620	0.0227	395.940	0.1000
115.300	0.0004	270.950	0.0249	413.610	0.1151
150.160	0.0008	295.360	0.0360	423.500	0.1263
156.440	0.0011	299.860	0.0382	434.790	0.1416
162.130	0.0014	321.040	0.0492	441.260	0.1783
187.280	0.0029	324.970	0.0513	445.890	0.1869
199.740	0.0044	328.880	0.0536	456.860	0.2177

Table 112. Test data for specimen 693–15

Test Number	: 245	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 195.8 MPa	Ultimate Stress	: 444.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
82.970	0.0002	199.740	0.0044	336.470	0.0582
93.520	0.0003	209.870	0.0059	340.870	0.0606
115.300	0.0004	216.440	0.0071	358.140	0.0714
125.980	0.0005	222.230	0.0082	370.810	0.0800
143.140	0.0007	232.580	0.0110	395.940	0.1000
150.160	0.0008	238.500	0.0129	425.300	0.1285
162.130	0.0014	249.310	0.0163	427.020	0.1307
167.380	0.0016	265.620	0.0227	434.790	0.1416
180.180	0.0025	270.950	0.0249	439.950	0.1761
187.280	0.0029	299.860	0.0382	448.150	0.1914
193.920	0.0036	321.040	0.0492	451.500	0.2004
				456.860	0.2177

Table 113. Test data for specimen 69–270

Test Number	: 235	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 193.6 MPa	Ultimate Stress	: 462.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
82.606	0.0001	228.049	0.0085	395.334	0.0963
95.725	0.0002	234.184	0.0103	413.701	0.1135
108.530	0.0002	277.671	0.0264	429.263	0.1313
143.211	0.0003	306.192	0.0395	437.264	0.1421
149.390	0.0005	310.405	0.0415	440.550	0.1470
160.181	0.0006	327.972	0.0507	444.849	0.1536
176.370	0.0014	335.471	0.0551	452.378	0.1682
183.372	0.0019	346.937	0.0616	453.404	0.1704
200.800	0.0036	356.335	0.0677	456.180	0.1769
205.624	0.0043	367.072	0.0747	461.617	0.1955
211.986	0.0052	387.093	0.0896	462.441	0.2042

Table 114. Test data for specimen 692–18

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 163.9 MPa	Ultimate Stress	: 444.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
86.25	0.0002	233.32	0.0099	384.31	0.0873
108.04	0.0005	237.94	0.0108	391.21	0.0936
127.83	0.0009	257.24	0.0164	397.21	0.1000
145.27	0.0015	274.69	0.0230	403.89	0.1066
160.58	0.0022	290.75	0.0295	410.65	0.1131
173.06	0.0029	304.75	0.0361	414.03	0.1197
184.30	0.0037	316.47	0.0425	420.17	0.1265
194.23	0.0045	328.74	0.0489	424.72	0.1332
203.26	0.0053	340.19	0.0554	429.06	0.1402
210.36	0.0062	349.15	0.0618	430.72	0.1472
216.84	0.0071	357.84	0.0682	435.75	0.1544
223.39	0.0080	367.77	0.0746	437.54	0.1618
228.42	0.0089	376.38	0.0809		

Table 115. Test data for specimen 692–24

Test Number	: 078	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 173.3 MPa	Ultimate Stress	: 494.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
140.73	0.0007	317.37	0.0229	461.09	0.1205
156.38	0.0012	322.53	0.0249	466.65	0.1281
172.08	0.0017	327.39	0.0268	468.26	0.1305
207.80	0.0034	334.90	0.0301	474.50	0.1394
226.34	0.0038	342.76	0.0344	475.86	0.1426
238.59	0.0044	349.63	0.0383	486.49	0.1584
245.57	0.0050	367.64	0.0486	486.86	0.1622
255.51	0.0061	375.24	0.0531	489.64	0.1719
264.06	0.0075	392.99	0.0648	491.96	0.1770
268.78	0.0082	403.24	0.0715	492.83	0.1794
299.05	0.0163	416.33	0.0811	493.41	0.1818
303.87	0.0180	439.77	0.0983	493.88	0.1844
308.58	0.0195	448.48	0.1067	494.54	0.1875
313.34	0.0212	456.50	0.1149	494.22	0.1914

Table 116. Test data for specimen 69–110

Test Number	: 079	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 196.9 MPa	Ultimate Stress	: 481.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
160.02	0.0019	289.49	0.0156	435.97	0.1017
167.34	0.0022	296.70	0.0180	446.92	0.1135
180.56	0.0028	302.91	0.0200	452.79	0.1209
198.25	0.0037	317.92	0.0264	460.29	0.1310
211.86	0.0042	329.33	0.0318	463.60	0.1362
225.14	0.0045	341.63	0.0386	466.27	0.1410
243.42	0.0056	352.95	0.0445	470.77	0.1497
248.87	0.0061	357.77	0.0473	473.15	0.1542
256.00	0.0074	362.99	0.0506	475.87	0.1620
260.72	0.0085	378.40	0.0606	478.16	0.1701
266.72	0.0097	394.94	0.0716	480.01	0.1788
272.41	0.0110	407.10	0.0808	481.00	0.1823
277.15	0.0122	416.71	0.0875	481.56	0.1897
282.46	0.0135	426.51	0.0956	481.39	0.1945

Table 117. Test data for specimen 691–06

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 177.7 MPa	Ultimate Stress	: 479.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
44.40	0.0003	244.83	0.0095	418.30	0.0858
69.36	0.0003	250.49	0.0106	425.89	0.0928
97.15	0.0004	255.73	0.0115	432.71	0.0997
121.28	0.0008	260.83	0.0125	441.06	0.1066
140.31	0.0012	283.24	0.0181	446.37	0.1138
157.48	0.0019	306.27	0.0248	452.71	0.1208
170.09	0.0025	324.19	0.3160	457.40	0.1280
182.78	0.0033	339.50	0.3830	461.26	0.1353
195.67	0.0041	353.98	0.0451	466.43	0.1425
206.22	0.0049	366.73	0.0518	468.43	0.1500
216.22	0.0059	378.38	0.0586	472.36	0.1577
223.60	0.0067	389.76	0.0655	474.22	0.1655
231.11	0.0077	399.69	0.0723	476.77	0.1739
238.08	0.0086	409.76	0.0790		

Table 118. Test data for specimen 692–09

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 175.7 MPa	Ultimate Stress	: 477.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
2.92	0.0002	218.70	0.0074	408.65	0.0914
23.44	0.0002	226.42	0.0084	418.58	0.0998
40.40	0.0004	232.01	0.0094	426.23	0.1086
59.50	0.0005	238.35	0.0105	433.40	0.1176
81.29	0.0007	243.80	0.0115	440.85	0.1268
104.04	0.0009	271.86	0.0180	447.88	0.1361
120.24	0.0014	296.68	0.0261	451.81	0.1457
141.07	0.0019	317.92	0.0340	455.95	0.1553
156.30	0.0025	334.67	0.0421	460.23	0.1653
169.34	0.0032	349.84	0.0500	464.43	0.1755
180.57	0.0040	363.97	0.0580	466.78	0.1861
192.85	0.0047	376.73	0.0661	471.12	0.1971
202.02	0.0056	387.55	0.0744	474.36	0.2090
210.36	0.0065	398.52	0.0828	475.05	0.2219

Table 119. Test data for specimen 18–11

Test Number	: 001	Test Temp.	: 25°C
Aging Temp.	: 280°C	Aging Time	: 68,000 h
Yield Stress	: 306.2 MPa	Ultimate Stress	: 554.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
48.09	0.0000	287.83	0.0037	424.09	0.0559
84.24	0.0002	293.75	0.0040	442.61	0.0788
107.98	0.0005	303.24	0.0044	457.71	0.0977
131.91	0.0007	307.15	0.0046	464.98	0.1083
155.85	0.0011	312.18	0.0048	469.05	0.1153
179.66	0.0015	317.03	0.0050	473.27	0.1224
203.60	0.0019	321.96	0.0052	482.07	0.1402
215.66	0.0019	326.61	0.0055	499.86	0.1778
227.53	0.0021	336.68	0.0062	515.08	0.2170
233.61	0.0021	348.23	0.0071	525.78	0.2579
239.97	0.0022	357.04	0.0082	531.32	0.2791
249.70	0.0024	363.74	0.0093	532.42	0.3007
256.30	0.0026	373.20	0.0117	546.59	0.3914
265.98	0.0029	378.00	0.0135	553.42	0.4691
275.32	0.0032	383.90	0.0165	553.66	0.4791
278.40	0.0033	394.22	0.0240	554.08	0.4840
283.24	0.0035	410.58	0.0399	554.87	0.4891

Table 120. Test data for specimen 18–12

Test Number	: 002	Test Temp.	: 25°C
Aging Temp.	: 280°C	Aging Time	: 68,000 h
Yield Stress	: 288.5 MPa	Ultimate Stress	: 555.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.90	0.0000	336.25	0.0074	485.06	0.0940
32.56	0.0001	341.27	0.0080	494.87	0.1032
54.54	0.0003	350.19	0.0090	505.27	0.1157
95.04	0.0008	359.80	0.0099	518.78	0.1330
148.66	0.0017	365.26	0.0112	528.90	0.1481
201.65	0.0024	379.81	0.0154	535.04	0.1613
210.18	0.0025	389.69	0.0190	540.25	0.1711
227.65	0.0027	404.24	0.0258	547.31	0.1880
237.14	0.0033	422.76	0.0380	551.00	0.2022
238.48	0.0033	442.28	0.0532	554.99	0.2214
250.50	0.0034	460.52	0.0701	556.14	0.2421
287.81	0.0048	479.33	0.0888	556.32	0.2550
312.16	0.0059				

Table 121. Test data for specimen 18–22

Test Number	: 003	Test Temp.	: 25°C
Aging Temp.	: 280°C	Aging Time	: 68,000 h
Yield Stress	: 291.9 MPa	Ultimate Stress	: 568.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
23.90	0.0000	313.52	0.0075	419.35	0.0572
48.59	0.0003	323.34	0.0087	457.49	0.0934
97.26	0.0009	332.66	0.0099	481.22	0.1144
145.01	0.0018	337.20	0.0107	484.37	0.1155
193.33	0.0030	347.14	0.0129	512.14	0.1563
241.06	0.0036	356.58	0.0161	537.27	0.2026
265.32	0.0046	365.48	0.0196	552.11	0.2431
289.62	0.0059	380.58	0.0276	558.67	0.2798
304.09	0.0068	394.97	0.0370	568.94	0.3292

Table 122. Test data for specimen 13–12

Test Number	: 028	Test Temp.	: 25°C
Aging Temp.	: Reannealed	Aging Time	: –
Yield Stress	: 317.3 MPa	Ultimate Stress	: 567.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
59.50	0.0001	352.87	0.0067	496.24	0.1460
99.30	0.0003	357.20	0.0073	510.41	0.1747
133.00	0.0006	361.96	0.0080	522.24	0.2028
163.07	0.0010	367.66	0.0091	529.11	0.2228
193.54	0.0016	372.86	0.0108	536.15	0.2462
201.94	0.0018	378.36	0.0130	542.22	0.2717
215.15	0.0020	385.83	0.0168	547.41	0.2928
229.30	0.0021	398.00	0.0259	552.36	0.3249
237.36	0.0022	415.43	0.0421	558.66	0.3637
280.74	0.0031	434.03	0.0634	562.70	0.4037
300.55	0.0036	449.93	0.0811	566.12	0.4461
319.41	0.0043	464.70	0.0982	567.34	0.4761
332.93	0.0050	474.03	0.1080	567.40	0.4995
346.78	0.0061	478.62	0.1167		

Table 123. Test data for specimen 13–21

Test Number	: 026	Test Temp.	: 25°C
Aging Temp.	: Reannealed	Aging Time	: –
Yield Stress	: 289.2 MPa	Ultimate Stress	: 575.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
43.57	0.0000	347.01	0.0081	488.50	0.0968
85.02	0.0002	353.99	0.0092	505.80	0.1120
130.85	0.0006	360.46	0.0107	523.90	0.1343
179.40	0.0014	368.83	0.0131	543.60	0.1667
232.59	0.0022	379.05	0.0167	555.16	0.1962
262.35	0.0028	388.82	0.0210	564.90	0.2333
276.49	0.0032	403.16	0.0286	571.38	0.2689
297.17	0.0040	421.66	0.0407	573.98	0.2871
310.87	0.0046	436.44	0.0518	573.92	0.2947
322.33	0.0053	453.33	0.0654	574.89	0.3157
331.48	0.0062	470.21	0.0788	575.17	0.3364
339.10	0.0070	483.57	0.0905	575.22	0.3509

Table 124. Test data for specimen 13–22

Test Number	: 027	Test Temp.	: 25°C
Aging Temp.	: Reannealed	Aging Time	: –
Yield Stress	: 287.7 MPa	Ultimate Stress	: 531.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
44.21	0.0000	331.47	0.0081	442.35	0.0957
85.37	0.0003	336.80	0.0093	455.83	0.1097
131.85	0.0008	341.69	0.0105	468.19	0.1252
174.19	0.0014	346.72	0.0124	473.23	0.1269
196.69	0.0019	354.13	0.0158	477.17	0.1347
214.31	0.0022	360.84	0.0195	478.12	0.1390
230.61	0.0024	370.52	0.0259	492.78	0.1656
260.12	0.0031	383.34	0.0361	504.02	0.1894
290.13	0.0042	394.21	0.0455	516.50	0.2247
302.55	0.0048	413.05	0.0640	526.42	0.2619
312.26	0.0056	429.39	0.0806	530.27	0.2926
320.50	0.0064	434.61	0.0856	531.25	0.3066
327.75	0.0074	436.25	0.0876		

Table 125. Test data for specimen 15–11

Test Number	: 057a	Test Temp.	: 290°C
Aging Temp.	: 280°C	Aging Time	: 68,000 h
Yield Stress	: 214.0 MPa	Ultimate Stress	: 469.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
48.99	0.0000	278.02	0.0076	438.50	0.1433
83.20	0.0002	281.34	0.0085	443.15	0.1514
122.05	0.0006	284.82	0.0095	452.28	0.1714
162.68	0.0013	287.99	0.0104	460.92	0.1953
189.28	0.0019	294.38	0.0127	466.31	0.2175
195.54	0.0021	319.77	0.0266	468.95	0.2414
201.11	0.0024	333.17	0.0365	468.76	0.2577
213.49	0.0026	348.54	0.0493	460.47	0.2747
220.74	0.0028	365.08	0.0638	434.38	0.2978
235.41	0.0030	380.97	0.0782	387.87	0.3198
245.10	0.0034	390.25	0.0864	308.74	0.3294
252.35	0.0039	402.23	0.0982	269.78	0.3309
260.15	0.0045	410.60	0.1048	213.57	0.3327
265.27	0.0052	420.39	0.1163	166.50	0.3340
271.57	0.0062	429.58	0.1286	156.46	0.3341

Table 126. Test data for specimen 15–12

Test Number	: 056	Test Temp.	: 290°C
Aging Temp.	: 280°C	Aging Time	: 68,000 h
Yield Stress	: 208.4 MPa	Ultimate Stress	: 444.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.39	0.0000	243.65	0.0045	355.26	0.0853
83.04	0.0003	247.23	0.0052	367.60	0.0977
119.69	0.0007	251.20	0.0060	374.04	0.1017
140.89	0.0010	255.94	0.0073	384.35	0.1144
158.51	0.0014	260.29	0.0086	392.07	0.1237
177.59	0.0019	264.10	0.0100	407.55	0.1429
186.93	0.0022	267.86	0.0116	413.00	0.1531
200.26	0.0026	270.93	0.0131	423.69	0.1712
208.37	0.0028	274.64	0.0149	429.49	0.1877
214.65	0.0029	278.49	0.0171	432.18	0.1915
219.32	0.0031	285.89	0.0220	435.42	0.1987
228.30	0.0033	294.90	0.0285	437.28	0.2026
235.71	0.0036	308.51	0.0400	441.72	0.2144
238.60	0.0039	325.75	0.0560	440.08	0.2189
240.86	0.0042	342.68	0.0724	444.39	0.2366

Table 127. Test data for specimen 15–21

Test Number	: 057b	Test Temp.	: 290°C
Aging Temp.	: 280°C	Aging Time	: 68,000 h
Yield Stress	: 199.6 MPa	Ultimate Stress	: 482.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.08	0.0000	250.40	0.0075	433.07	0.1692
94.79	0.0003	257.78	0.0102	440.72	0.1815
146.04	0.0010	264.58	0.0134	447.58	0.1937
162.41	0.0013	274.87	0.0188	453.33	0.2104
178.43	0.0017	293.17	0.0310	460.34	0.2232
189.53	0.0020	309.98	0.0435	463.99	0.2327
192.57	0.0022	321.99	0.0535	469.40	0.2442
195.81	0.0024	334.15	0.0638	472.72	0.2647
206.61	0.0027	348.83	0.0767	475.88	0.2751
211.14	0.0029	365.16	0.0909	477.68	0.2832
215.98	0.0031	380.65	0.1025	480.52	0.2991
224.75	0.0034	402.73	0.1264	480.74	0.3092
233.03	0.0038	411.79	0.1389	481.60	0.3166
238.07	0.0043	426.78	0.1597	482.51	0.3284
243.35	0.0054				

Table 128. Test data for specimen 15–22

Test Number	: 058	Test Temp.	: 290°C
Aging Temp.	: 280°C	Aging Time	: 68,000 h
Yield Stress	: 180.2 MPa	Ultimate Stress	: 434.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
34.92	0.0000	204.38	0.0055	364.37	0.1249
81.09	0.0003	209.24	0.0059	370.79	0.1328
120.94	0.0009	214.55	0.0065	375.87	0.1406
144.27	0.0014	220.45	0.0072	381.69	0.1491
159.54	0.0019	227.00	0.0080	391.10	0.1642
165.71	0.0021	237.95	0.0098	399.87	0.1797
172.82	0.0024	252.42	0.0181	401.75	0.1814
178.83	0.0027	264.31	0.0273	409.03	0.1954
184.30	0.0032	277.23	0.0387	411.64	0.2005
186.79	0.0034	288.27	0.0491	419.25	0.2181
190.91	0.0038	302.62	0.0627	422.72	0.2286
194.69	0.0043	314.15	0.0741	426.14	0.2408
196.38	0.0045	326.02	0.0859	428.19	0.2480
199.56	0.0050	330.52	0.0903	431.89	0.2636
201.99	0.0053	347.48	0.1053	434.03	0.2816

Table 129. Test data for specimen 16–21

Test Number	: 060	Test Temp.	: 290°C
Aging Temp.	: Reannealed	Aging Time	: –
Yield Stress	: 184.0 MPa	Ultimate Stress	: 405.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
73.83	0.0002	263.54	0.0096	427.35	0.0939
105.52	0.0006	274.92	0.0124	446.96	0.1061
127.98	0.0009	285.57	0.0155	462.80	0.1199
141.76	0.0012	294.26	0.0185	473.64	0.1309
156.10	0.0016	301.80	0.0212	482.97	0.1419
167.01	0.0020	317.07	0.0277	483.46	0.1437
176.70	0.0024	343.30	0.0410	485.46	0.1484
191.30	0.0033	363.02	0.0523	494.14	0.1610
202.85	0.0039	379.90	0.0624	500.51	0.1719
226.10	0.0048	395.39	0.0723	504.16	0.1812
240.81	0.0057	414.01	0.0844	505.94	0.1900
251.80	0.0072	432.47	0.0972		

Table 130. Test data for specimen 17–21

Test Number	: 059	Test Temp.	: 290°C
Aging Temp.	: Reannealed	Aging Time	: –
Yield Stress	: 171.5 MPa	Ultimate Stress	: 416.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
47.67	0.0000	206.10	0.0063	371.77	0.1798
85.55	0.0003	208.03	0.0065	379.86	0.1942
114.31	0.0007	210.94	0.0070	386.78	0.2092
140.22	0.0012	220.28	0.0086	390.72	0.2216
156.57	0.0017	230.71	0.0105	393.02	0.2293
164.89	0.0020	246.73	0.0207	395.16	0.2356
173.91	0.0024	259.45	0.0331	400.01	0.2503
180.02	0.0028	270.48	0.0460	403.95	0.2639
185.68	0.0033	286.56	0.0643	406.29	0.2704
189.43	0.0039	301.82	0.0830	410.18	0.2900
193.47	0.0045	316.97	0.0985	412.48	0.3016
195.79	0.0050	330.80	0.1155	414.70	0.3139
198.36	0.0056	340.41	0.1284	416.19	0.3330
201.41	0.0059	348.69	0.1405		
203.83	0.0061	358.81	0.1550		

Table 131. Test data for specimen P13T–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 244.7 MPa	Ultimate Stress	: 584.5 MPa

Experimental Data Not Available.

Table 132. Test data for specimen P13T–03

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 245.9 MPa	Ultimate Stress	: 579.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
10.20	0.0002	136.31	0.0010	263.38	0.0053
18.68	0.0003	156.17	0.0012	270.48	0.0062
28.96	0.0003	175.54	0.0014	275.72	0.0070
37.78	0.0003	192.16	0.0017	279.72	0.0078
54.26	0.0004	210.08	0.0021	285.65	0.0087
68.95	0.0005	224.70	0.0026	288.20	0.0095
84.25	0.0006	236.15	0.0031	291.72	0.0104
100.11	0.0007	247.80	0.0038	296.68	0.0113
118.59	0.0008	256.76	0.0045	298.06	0.0123

Table 133. Test data for specimen P11A–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Y	– MPa	Ultimate Stress	: 584.9 MPa

Experimental Data Not Available.

Table 134. Test data for specimen P13A–01

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 248.5 MPa	Ultimate Stress	: 584.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
17.93	0.0002	125.42	0.0008	275.79	0.0067
20.96	0.0002	143.20	0.0009	280.62	0.0076
23.44	0.0002	162.65	0.0011	285.79	0.0084
26.89	0.0002	181.81	0.0014	288.20	0.0093
29.30	0.0002	197.95	0.0017	292.06	0.0102
30.89	0.0002	214.36	0.0021	295.92	0.0111
33.09	0.0003	228.63	0.0025	297.16	0.0120
34.89	0.0003	239.11	0.0030	300.96	0.0130
53.57	0.0004	249.93	0.0037	303.30	0.0139
70.95	0.0005	257.45	0.0043	305.51	0.0149
86.32	0.0005	264.55	0.0051	309.44	0.0159
104.39	0.0006	271.52	0.0059	310.40	0.0168

Table 135. Test data for specimen P14T–09

Test Number	: 117	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 266.2 MPa	Ultimate Stress	: 596.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	398.64	0.0486	545.00	0.2716
77.21	0.0002	422.46	0.0680	559.25	0.3307
212.73	0.0018	442.43	0.0858	561.89	0.3462
258.67	0.0025	465.90	0.1064	566.23	0.3725
291.99	0.0042	478.01	0.1209	577.95	0.4433
311.40	0.0062	481.09	0.1354	591.37	0.5609
326.33	0.0093	481.39	0.1361	590.97	0.5612
354.39	0.0201	507.72	0.1791	595.58	0.6312
354.49	0.0204	529.83	0.2271	596.15	0.6717
380.79	0.0348	537.08	0.2433		

Table 136. Test data for specimen P11A–25

Test Number	: 102	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 285.7 MPa	Ultimate Stress	: 595.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	327.99	0.0134	485.84	0.1723
68.60	0.0002	330.65	0.0149	503.01	0.2040
147.31	0.0010	391.70	0.0575	524.41	0.2531
181.90	0.0016	395.97	0.0605	546.10	0.3130
205.98	0.0015	410.10	0.0741	557.67	0.3579
222.63	0.0017	420.72	0.0850	564.19	0.3855
258.83	0.0025	431.76	0.0957	575.74	0.4433
283.36	0.0036	445.71	0.1083	582.95	0.4831
299.93	0.0050	445.67	0.1083	590.96	0.5406
307.02	0.0061	467.17	0.1347	595.22	0.6055
311.57	0.0060	483.61	0.1593		

Table 137. Test data for specimen P14A–26

Test Number	: 104	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 276.5 MPa	Ultimate Stress	: 575.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
73.86	0.0001	360.33	0.0196	494.94	0.1349
202.47	0.0013	391.83	0.0374	512.42	0.1575
219.88	0.0015	422.46	0.0598	537.40	0.2028
230.30	0.0016	442.39	0.0783	553.09	0.2403
269.71	0.0022	457.87	0.0911	564.42	0.2757
296.90	0.0035	469.61	0.0986	569.81	0.3036
314.51	0.0054	480.19	0.1109	573.78	0.3211
330.05	0.0088	488.72	0.1263	575.68	0.3664
345.39	0.0137				

Table 138. Test data for specimen P11A–28

Test Number	: 284	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 58,000 h
Yield Stress	: 263.5 MPa	Ultimate Stress	: 536.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
18.772	0.0001	323.730	0.0296	492.111	0.2443
41.505	0.0002	353.702	0.0567	498.424	0.2577
53.992	0.0003	377.558	0.0811	510.328	0.2873
111.117	0.0006	379.486	0.0833	514.377	0.2989
135.575	0.0008	389.501	0.0944	515.051	0.3012
197.871	0.0012	399.024	0.1055	518.666	0.3128
209.283	0.0014	418.340	0.1289	522.281	0.3268
219.264	0.0016	426.745	0.1400	526.040	0.3431
256.470	0.0030	441.324	0.1597	532.642	0.3867
266.986	0.0038	460.765	0.1885	534.233	0.4051
297.088	0.0107	468.973	0.2017	535.968	0.4516

Table 139. Test data for specimen P11A–29

Test Number	: 285	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 58,000 h
Yield Stress	: 266.1 MPa	Ultimate Stress	: 562.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.859	0.0001	292.610	0.0071	472.097	0.2052
20.549	0.0001	318.089	0.0177	483.990	0.2298
35.176	0.0002	350.081	0.0412	491.974	0.2477
76.772	0.0004	367.359	0.0571	502.618	0.2745
87.465	0.0004	384.826	0.0751	515.005	0.3103
99.875	0.0005	394.609	0.0864	524.536	0.3420
160.545	0.0008	411.273	0.1068	531.262	0.3672
172.878	0.0009	427.903	0.1300	549.938	0.4652
184.911	0.0010	439.883	0.1481	552.503	0.4836
249.253	0.0025	460.214	0.1828	560.583	0.5582
281.777	0.0050	465.207	0.1917	561.986	0.5795

Table 140. Test data for specimen P11A–10

Test Number	: 216	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 279.1 MPa	Ultimate Stress	: 622.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.015	0.0001	328.678	0.0089	529.516	0.1867
28.397	0.0002	333.701	0.0101	565.073	0.2543
50.324	0.0003	383.033	0.0358	581.929	0.2987
61.112	0.0004	401.113	0.0488	585.086	0.3076
95.717	0.0006	403.974	0.0511	606.216	0.3890
158.146	0.0009	438.987	0.0801	609.713	0.4072
245.309	0.0021	480.820	0.1218	616.368	0.4508
253.270	0.0024	488.276	0.1305	619.088	0.4718
260.644	0.0027	499.011	0.1434	619.137	0.4741
286.243	0.0040	510.523	0.1586	621.274	0.4975
322.655	0.0077	519.558	0.1716	622.537	0.5277

Table 141. Test data for specimen P11T–06

Test Number	: 103	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 280.0 MPa	Ultimate Stress	: 569.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	342.55	0.0035	479.03	0.1020
97.90	0.0002	366.58	0.0043	485.02	0.1088
186.78	0.0011	374.51	0.0049	491.88	0.1191
195.30	0.0013	374.45	0.0048	504.42	0.1376
210.26	0.0016	376.06	0.0061	529.48	0.1813
210.85	0.0017	381.40	0.0094	546.00	0.2204
229.20	0.0017	390.14	0.0159	560.78	0.2703
248.99	0.0020	425.73	0.0470	565.59	0.2916
318.37	0.0029	442.01	0.0635	569.21	0.3316
321.97	0.0031	468.24	0.0982	569.34	0.3603

Table 142. Test data for specimen P14T–08

Test Number	: 100	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 279.1 MPa	Ultimate Stress	: 595.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	379.65	0.0340	515.57	0.1577
130.91	0.0008	393.44	0.0422	521.05	0.1650
195.03	0.0019	404.80	0.0504	528.04	0.1762
218.36	0.0024	416.36	0.0590	536.84	0.1915
242.09	0.0027	426.20	0.0661	543.64	0.2056
251.86	0.0030	431.24	0.0709	485.56	0.2200
261.87	0.0033	451.27	0.0884	560.09	0.2446
271.49	0.0037	460.07	0.0954	570.86	0.2784
280.91	0.0043	465.27	0.0983	581.68	0.3217
295.96	0.0055	471.26	0.1042	583.65	0.3378
314.86	0.0079	478.93	0.1127	585.00	0.3490
329.57	0.0111	492.34	0.1283	585.65	0.3596
339.05	0.0140	498.90	0.1343	587.54	0.3614
354.26	0.0203	506.39	0.1460	588.05	0.3651
367.74	0.0262	509.78	0.1502	589.10	0.3950

Table 143. Test data for specimen P11A–13

Test Number	: 281	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 299.0 MPa	Ultimate Stress	: 646.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.902	0.0001	359.101	0.0102	614.679	0.3235
25.967	0.0001	365.251	0.0119	626.149	0.3694
64.721	0.0002	370.441	0.0136	626.631	0.3714
75.416	0.0003	406.347	0.0308	629.764	0.3871
173.574	0.0006	429.615	0.0456	632.222	0.3995
186.428	0.0007	438.753	0.0519	632.752	0.4016
198.896	0.0008	452.705	0.0623	638.632	0.4379
211.070	0.0009	478.162	0.0840	640.994	0.4568
278.813	0.0023	561.231	0.1897	641.524	0.4609
286.481	0.0026	588.172	0.2458	646.006	0.5110
300.163	0.0032	610.534	0.3092	646.777	0.5475

Table 144. Test data for specimen P12A–25

Test Number	: 282	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 55,000 h
Yield Stress	: 287.6 MPa	Ultimate Stress	: 688.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
19.268	0.0001	476.490	0.0661	656.994	0.3383
21.177	0.0001	499.011	0.0830	660.127	0.3491
73.420	0.0003	527.735	0.1082	660.657	0.3513
109.798	0.0004	559.062	0.1418	671.067	0.3954
186.235	0.0009	560.845	0.1439	672.465	0.4021
269.237	0.0025	605.956	0.2110	681.333	0.4543
284.794	0.0031	620.848	0.2400	681.622	0.4566
316.501	0.0049	629.330	0.2590	685.333	0.4869
353.028	0.0091	639.451	0.2844	687.261	0.5076
398.963	0.0225	651.259	0.3187	688.032	0.5225
460.710	0.0555	655.259	0.3317	688.321	0.5306

Table 145. Test data for specimen P12T–05

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 276.8 MPa	Ultimate Stress	: 610.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
49.6422	0.0003	346.8752	0.0156	549.5121	0.2378
82.9439	0.0005	349.8400	0.0172	557.4411	0.2554
121.3477	0.0007	354.0457	0.0188	563.5774	0.2731
161.4062	0.0010	383.6932	0.0355	569.3000	0.2910
197.6727	0.0013	409.3417	0.0526	574.4022	0.3091
229.7333	0.0019	429.8881	0.0690	579.7801	0.3273
255.6576	0.0027	448.2281	0.0853	585.1580	0.3457
276.8245	0.0037	464.0861	0.1019	586.6748	0.3642
294.5440	0.0049	480.0819	0.1184	592.1907	0.3832
307.3683	0.0062	492.0788	0.1352	595.5002	0.4029
316.8141	0.0077	503.7999	0.1520	598.0512	0.4225
325.8462	0.0092	516.0036	0.1690	600.7401	0.4432
330.6036	0.0107	525.1047	0.1860	602.7396	0.4670
337.9810	0.0124	534.6194	0.2031	605.4976	0.4893
341.9799	0.0140	542.3416	0.2204		

Table 146. Test data for specimen P12T–06

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 263.4 MPa	Ultimate Stress	: 608.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
2.42	0.0002	48.37	0.0174	552.27	0.3247
4.53	0.0003	48.85	0.0192	558.20	0.3496
9.51	0.0006	49.33	0.0210	564.82	0.3746
14.84	0.0010	49.67	0.0228	570.89	0.4001
21.36	0.0015	55.26	0.0502	577.64	0.4259
27.03	0.0019	409.62	0.0764	582.47	0.4517
31.95	0.0027	433.89	0.1016	586.67	0.4780
35.57	0.0037	454.50	0.1265	591.23	0.5047
38.61	0.0048	473.81	0.1512	593.78	0.5319
40.95	0.0060	488.56	0.1759	597.71	0.5596
42.94	0.0074	502.35	0.2007	600.88	0.5880
44.43	0.0089	514.28	0.2253	602.95	0.6174
45.41	0.0104	524.69	0.2501	605.43	0.6479
46.52	0.0121	535.38	0.2750	607.01	0.6804
47.03	0.0138	543.31	0.2997	608.74	0.7155
47.88	0.0156				

Table 147. Test data for specimen P12A–08

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 290.5 MPa	Ultimate Stress	: 652.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
33.78	0.0002	357.56	0.0107	590.88	0.2098
64.40	0.0003	361.70	0.0118	599.77	0.2241
98.87	0.0005	366.53	0.0129	605.01	0.2383
135.76	0.0007	398.38	0.0263	612.25	0.2525
171.61	0.0009	427.06	0.0406	617.43	0.2667
207.74	0.0012	449.88	0.0547	621.77	0.2810
238.01	0.0018	469.60	0.0687	626.94	0.2952
262.21	0.0024	487.18	0.0828	629.84	0.3093
282.62	0.0031	503.11	0.0968	633.63	0.3232
298.89	0.0039	519.11	0.1109	637.70	0.3372
311.99	0.0047	533.38	0.1250	640.66	0.3509
324.81	0.0055	545.44	0.1391	643.63	0.3647
334.53	0.0065	555.72	0.1531	645.56	0.3781
341.43	0.0075	567.37	0.1674	646.31	0.3911
347.43	0.0085	576.13	0.1815	649.62	0.4038
353.70	0.0096	584.47	0.1957	649.97	0.4154

Table 148. Test data for specimen P12A–09

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 271.2 MPa	Ultimate Stress	: 618.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
52.33	0.0003	337.71	0.0125	569.30	0.2471
88.32	0.0005	341.77	0.0135	574.82	0.2621
125.14	0.0007	370.87	0.0289	579.37	0.2771
161.89	0.0010	397.69	0.0458	586.61	0.2918
196.57	0.0013	419.68	0.0624	590.19	0.3064
225.18	0.0018	439.47	0.0785	593.85	0.3209
247.11	0.0025	458.71	0.0944	596.74	0.3352
264.76	0.0033	474.91	0.1099	600.81	0.3494
281.79	0.0042	487.46	0.1255	604.67	0.3632
292.75	0.0052	501.59	0.1408	605.98	0.3770
304.33	0.0063	515.73	0.1561	608.46	0.3905
313.16	0.0074	525.86	0.1714	612.12	0.4034
318.47	0.0084	537.79	0.1866	614.05	0.4159
323.64	0.0093	546.13	0.2017	615.49	0.4278
329.29	0.0103	555.37	0.2169	616.60	0.4387

Table 149. Test data for specimen P12T–11

Test Number	: 099	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 266.6 MPa	Ultimate Stress	: 617.0 MPa

Experimental Data Not Available.

Table 150. Test data for specimen P12A–13

Test Number	: 101	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 285.0 MPa	Ultimate Stress	: 637.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	382.46	0.0223	566.26	0.1812
49.37	0.0000	398.99	0.0318	572.27	0.1902
161.89	0.0009	410.33	0.0397	587.25	0.2119
206.33	0.0016	421.33	0.0475	593.62	0.2245
225.89	0.0019	433.67	0.0575	594.21	0.2286
234.97	0.0019	441.67	0.0635	605.26	0.2540
255.46	0.0024	459.16	0.0774	611.66	0.2733
280.06	0.0031	475.46	0.0900	613.91	0.2805
304.05	0.0042	484.00	0.0975	621.37	0.3072
318.41	0.0052	490.72	0.1026	623.09	0.3087
339.82	0.0081	510.64	0.1197	629.77	0.3427
347.56	0.0094	534.67	0.1421	632.39	0.3721
365.68	0.0148	543.77	0.1509	636.66	0.4754
372.37	0.0177	548.22	0.1572	637.29	0.5645

Table 151. Test data for specimen P12A–14

Test Number	: 217	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 263.5 MPa	Ultimate Stress	: 634.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
10.264	0.0001	342.201	0.0129	596.647	0.2397
50.246	0.0003	394.609	0.0349	597.521	0.2417
95.207	0.0006	415.836	0.0472	602.670	0.2540
109.226	0.0007	451.189	0.0709	610.296	0.2745
122.011	0.0008	467.432	0.0829	615.008	0.2889
184.580	0.0013	480.159	0.0931	621.177	0.3114
206.643	0.0016	489.685	0.1011	623.752	0.3237
241.787	0.0027	529.808	0.1397	630.844	0.3621
262.728	0.0037	531.508	0.1417	632.592	0.3754
281.244	0.0047	546.955	0.1599	632.689	0.3777
291.503	0.0055	562.450	0.1802	637.433	0.4128

Table 152. Test data for specimen P13T–07

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 285.0 MPa	Ultimate Stress	: 660.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
94.94	0.0004	375.01	0.0145	606.39	0.2093
135.34	0.0005	378.52	0.0159	613.01	0.2243
171.96	0.0006	412.31	0.0281	620.11	0.2396
205.33	0.0010	438.23	0.0417	625.77	0.2551
233.53	0.0015	458.85	0.0552	631.42	0.2708
258.14	0.0022	478.36	0.0687	636.94	0.2868
278.89	0.0031	498.22	0.0823	641.49	0.3033
297.16	0.0042	514.35	0.0957	645.56	0.3200
312.95	0.0053	530.48	0.1094	648.87	0.3370
327.57	0.0064	542.76	0.1232	653.00	0.3544
337.91	0.0077	556.61	0.1371	654.24	0.3724
346.05	0.0089	568.61	0.1512	657.69	0.3907
354.67	0.0103	578.19	0.1655	655.62	0.4099
361.22	0.0117	587.98	0.1797	658.79	0.4301
368.94	0.0131	597.64	0.1944		

Table 153. Test data for specimen P13A–07

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 286.3 MPa	Ultimate Stress	: 677.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
4.14	0.0002	372.59	0.0144	627.49	0.2488
57.36	0.0003	379.00	0.0160	634.39	0.2679
90.39	0.0004	382.93	0.0176	640.66	0.2873
127.55	0.0006	422.79	0.0344	647.69	0.3070
168.03	0.0008	454.99	0.0522	652.52	0.3272
210.15	0.0010	478.36	0.0696	657.07	0.3477
250.56	0.0014	503.80	0.0870	661.41	0.3686
274.07	0.0024	524.97	0.1043	664.10	0.3901
289.37	0.0035	542.76	0.1218	666.59	0.4119
307.09	0.0046	560.20	0.1394	668.17	0.4344
320.88	0.0058	572.82	0.1572	671.55	0.4573
333.84	0.0071	587.30	0.1750	673.14	0.4807
342.88	0.0084	598.88	0.1932	674.24	0.5049
352.32	0.0099	609.36	0.2116	675.69	0.5298
359.15	0.0113	619.22	0.2301	675.96	0.5555
366.66	0.0128				

Table 154. Test data for specimen P13T–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 148.5 MPa	Ultimate Stress	: 408.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
19.44	0.0000	119.28	0.0014	179.26	0.0112
22.06	0.0002	130.72	0.0019	181.06	0.0120
25.72	0.0003	140.45	0.0025	183.81	0.0129
29.65	0.0003	146.51	0.0030	185.47	0.0136
35.23	0.0003	152.99	0.0038	186.50	0.0145
39.85	0.0004	156.86	0.0045	188.57	0.0153
40.82	0.0004	161.48	0.0054	189.88	0.0160
45.78	0.0004	164.85	0.0061	191.95	0.0170
51.92	0.0004	166.92	0.0070	192.92	0.0177
57.09	0.0005	170.09	0.0079	195.47	0.0185
62.12	0.0005	172.30	0.0087	196.36	0.0192
67.50	0.0005	174.99	0.0096	198.29	0.0201
83.77	0.0007	176.99	0.0103	199.12	0.0209
102.11	0.0010				

Table 155. Test data for specimen P14T–01

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 157.0 MPa	Ultimate Stress	: 437.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
5.03	0.0000	121.69	0.0024	184.50	0.0096
5.93	0.0002	135.41	0.0031	187.26	0.0103
7.52	0.0002	146.44	0.0039	189.81	0.0112
16.41	0.0003	154.72	0.0044	192.02	0.0121
26.61	0.0005	162.10	0.0050	194.91	0.0129
36.54	0.0006	167.40	0.0055	196.71	0.0138
48.54	0.0008	171.75	0.0063	198.02	0.0147
63.50	0.0010	175.75	0.0071	201.05	0.0156
76.67	0.0012	178.92	0.0078	203.05	0.0166
91.98	0.0015	181.95	0.0087	205.05	0.0173
108.25	0.0019				

Table 156. Test data for specimen P11A–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 159.9 MPa	Ultimate Stress	: 442.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
39.99	0.0000	174.37	0.0059	235.32	0.0350
45.16	0.0001	177.61	0.0071	239.32	0.0374
50.68	0.0002	181.26	0.0087	243.45	0.0401
55.36	0.0002	187.12	0.0108	247.04	0.0425
60.88	0.0003	190.43	0.0124	251.18	0.0453
70.26	0.0003	196.02	0.0151	257.52	0.0493
81.36	0.0003	199.81	0.0172	266.76	0.0536
117.42	0.0005	204.64	0.0192	277.86	0.0610
137.76	0.0009	209.67	0.0219	288.82	0.0677
152.72	0.0018	214.01	0.0249	298.96	0.0752
163.61	0.0031	222.56	0.0283	308.40	0.0810
169.06	0.0045	229.60	0.0319		

Table 157. Test data for specimen P13A–02

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 155.0 MPa	Ultimate Stress	: 424.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
4.55	0.0006	139.48	0.0037	179.33	0.0116
9.03	0.0006	148.24	0.0045	181.88	0.0126
19.44	0.0006	155.13	0.0053	184.43	0.0135
33.58	0.0008	160.30	0.0061	186.37	0.0145
50.26	0.0011	164.72	0.0071	188.30	0.0155
65.50	0.0013	168.44	0.0080	190.50	0.0163
83.36	0.0018	171.47	0.0089	192.36	0.0173
99.84	0.0022	174.37	0.0098	194.43	0.0186
113.76	0.0026	177.06	0.0107	196.43	0.0195
128.31	0.0031				

Table 158. Test data for specimen P14T–10

Test Number	: 263	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 166.1 MPa	Ultimate Stress	: 415.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
49.686	0.0003	196.581	0.0124	356.289	0.1380
51.137	0.0003	200.884	0.0146	358.380	0.1401
64.981	0.0002	220.424	0.0261	376.128	0.1592
73.645	0.0002	231.175	0.0328	383.481	0.1701
79.114	0.0002	250.488	0.0455	387.668	0.1814
110.354	0.0003	280.509	0.0671	397.185	0.1978
126.569	0.0005	294.898	0.0782	397.773	0.2001
145.661	0.0010	313.219	0.0934	402.525	0.2112
160.219	0.0018	325.714	0.1050	406.577	0.2203
176.655	0.0047	337.274	0.1163	410.779	0.2642
181.604	0.0060	346.762	0.1270	415.188	0.2843

Table 159. Test data for specimen P11A–26

Test Number	: 265	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 160.3 MPa	Ultimate Stress	: 394.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.339	0.0002	205.024	0.0281	325.205	0.1856
46.026	0.0002	215.729	0.0372	336.590	0.2027
100.931	0.0004	233.148	0.0528	347.127	0.2183
110.489	0.0005	244.451	0.0633	360.859	0.2450
133.822	0.0008	259.567	0.0782	365.983	0.2559
139.770	0.0010	270.238	0.0891	369.260	0.2627
157.315	0.0022	276.340	0.0955	381.426	0.2957
162.839	0.0029	285.966	0.1060	383.735	0.3046
177.574	0.0089	301.592	0.1241	384.747	0.3067
181.396	0.0109	315.777	0.1397	390.256	0.3254
191.523	0.0175	317.286	0.1419	390.473	0.3319

Table 160. Test data for specimen P14A–27

Test Number	: 069	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 167.8 MPa	Ultimate Stress	: 421.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
134.280	0.0012	265.850	0.0374	376.520	0.1388
146.280	0.0015	277.030	0.0468	381.110	0.1481
161.390	0.0022	287.480	0.0538	383.420	0.1503
169.850	0.0028	302.560	0.0676	393.740	0.1639
181.710	0.0043	313.840	0.0770	401.590	0.1785
194.170	0.0076	326.900	0.0858	403.420	0.1817
197.230	0.0102	339.030	0.0983	408.260	0.1914
204.710	0.0114	350.120	0.1068	412.750	0.2018
212.740	0.0124	360.970	0.1193	417.410	0.2177
239.090	0.0190	366.940	0.1261	420.670	0.2220
243.280	0.0220	368.280	0.1283	421.580	0.2393

Table 161. Test data for specimen P11A–27

Test Number	: 315	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 58,000 h
Yield Stress	: 167.1 MPa	Ultimate Stress	: 388.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.980	0.0001	204.120	0.0202	328.720	0.1419
54.880	0.0001	229.190	0.0407	336.880	0.1529
97.240	0.0003	236.930	0.0473	347.870	0.1685
107.290	0.0004	249.160	0.0583	353.210	0.1752
116.870	0.0005	251.570	0.0605	361.390	0.1883
145.360	0.0011	263.320	0.0715	362.680	0.1906
150.570	0.0013	272.420	0.0804	370.580	0.2095
158.440	0.0018	285.480	0.0934	372.830	0.2135
182.450	0.0067	294.030	0.1024	378.260	0.2243
187.190	0.0090	312.070	0.1221	382.680	0.2377
191.190	0.0113	323.330	0.1354	387.850	0.2556

Table 162. Test data for specimen P11A–30

Test Number	: 314	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 58,000 h
Yield Stress	: 179.3 MPa	Ultimate Stress	: 445.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.878	0.0001	202.720	0.0102	370.226	0.1596
20.989	0.0001	220.071	0.0210	376.627	0.1684
48.486	0.0002	244.253	0.0389	383.251	0.1772
60.940	0.0002	247.113	0.0410	393.064	0.1922
107.906	0.0003	261.265	0.0523	397.907	0.2020
118.106	0.0004	285.056	0.0718	424.204	0.2578
127.299	0.0005	297.408	0.0828	426.516	0.2647
135.616	0.0006	318.571	0.1026	431.229	0.2787
176.196	0.0023	329.685	0.1135	436.938	0.2944
192.908	0.0059	346.387	0.1310	440.770	0.3198
198.148	0.0080	355.396	0.1421	444.927	0.3280

Table 163. Test data for specimen P11A–09

Test Number	: 073	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 175.5 MPa	Ultimate Stress	: 435.1 MPa

Experimental Data Not Available.

Table 164. Test data for specimen P12A–19

Test Number	: 074	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 174.8 MPa	Ultimate Stress	: 456.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
131.38	0.0006	262.30	0.0224	378.76	0.1026
168.14	0.0014	269.07	0.0268	390.99	0.1123
180.81	0.0020	276.04	0.0311	398.61	0.1187
190.28	0.0029	283.06	0.0357	404.47	0.1246
197.47	0.0039	290.72	0.0404	408.04	0.1292
202.65	0.0046	303.47	0.0495	413.26	0.1348
205.37	0.0051	307.01	0.0532	425.04	0.1485
211.97	0.0056	316.34	0.0608	430.30	0.1550
220.18	0.0063	326.74	0.0668	435.21	0.1623
228.18	0.0072	332.58	0.0705	438.72	0.1677
236.77	0.0087	343.90	0.0795	442.50	0.1747
241.73	0.0111	350.90	0.0850	447.03	0.1836
245.57	0.0135	357.43	0.0888	450.03	0.1908
250.99	0.0160	365.46	0.0937	453.65	0.2018
255.46	0.0191	372.84	0.0975	456.90	0.2180

Table 165. Test data for specimen P12A–22

Test Number	: 067	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 175.4 MPa	Ultimate Stress	: 418.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
138.43	0.0011	289.17	0.0404	384.32	0.1234
166.32	0.0019	297.39	0.0463	388.06	0.1280
176.63	0.0025	304.19	0.0518	390.71	0.1316
186.34	0.0033	310.83	0.0574	394.10	0.1367
195.62	0.0045	316.83	0.0621	397.10	0.1411
202.28	0.0052	323.18	0.0673	401.91	0.1495
209.26	0.0059	328.93	0.0720	403.92	0.1535
216.53	0.0065	334.40	0.0771	406.13	0.1583
223.90	0.0072	340.70	0.0821	407.94	0.1627
231.96	0.0082	346.22	0.0872	410.95	0.1687
240.23	0.0102	352.72	0.0925	412.72	0.1736
248.20	0.0138	358.78	0.0979	414.59	0.1791
256.42	0.0183	363.96	0.1009	416.12	0.1842
263.99	0.0229	370.68	0.1078	417.60	0.1905
271.92	0.0278	376.35	0.1139	418.34	0.1961
280.94	0.0344	380.58	0.1187	418.67	0.2057

Table 166. Test data for specimen P12A-22

Test Number	: 067	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 175.4 MPa	Ultimate Stress	: 418..7MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
138.430	0.0011	240.230	0.0102	380.580	0.1187
154.150	0.0015	248.200	0.0138	384.320	0.1234
166.320	0.0019	256.420	0.0183	388.060	0.1280
176.630	0.0025	263.990	0.0229	390.710	0.1316
186.340	0.0033	271.920	0.0278	399.600	0.1454
195.620	0.0045	280.940	0.0344	401.910	0.1495
202.280	0.0052	297.390	0.0463	410.950	0.1687
209.260	0.0059	323.180	0.0673	412.720	0.1736
216.530	0.0065	328.930	0.0720	414.590	0.1791
223.900	0.0072	352.720	0.0925	416.120	0.1842
231.960	0.0082	367.340	0.1040	418.670	0.2057

Table 167. Test data for specimen P11A-12

Test Number	: 310	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 188.2 MPa	Ultimate Stress	: 424.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
11.551	0.0001	247.372	0.0335	359.065	0.1530
17.176	0.0001	259.991	0.0440	372.345	0.1731
123.234	0.0002	277.304	0.0595	377.431	0.1816
131.103	0.0003	286.567	0.0685	389.453	0.2048
151.510	0.0007	293.333	0.0751	392.761	0.2117
175.865	0.0017	304.078	0.0860	397.788	0.2230
182.490	0.0022	308.212	0.0905	402.369	0.2343
187.882	0.0030	322.206	0.1061	413.527	0.2687
210.120	0.0090	329.793	0.1148	417.995	0.2912
222.346	0.0154	347.479	0.1371	418.821	0.2935
235.500	0.0246	352.444	0.1437	424.466	0.3186

Table 168. Test data for specimen P12T–08

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 180.2 MPa	Ultimate Stress	: 454.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
3.19	0.0000	214.63	0.0086	375.49	0.1017
4.50	0.0003	218.63	0.0097	383.56	0.1078
6.80	0.0005	232.90	0.0151	391.07	0.1138
9.48	0.0006	247.73	0.0218	397.00	0.1199
12.72	0.0008	260.90	0.0285	404.10	0.1259
16.01	0.0010	273.17	0.0351	411.34	0.1317
18.54	0.0013	286.68	0.0428	416.24	0.1374
20.88	0.0017	299.72	0.0506	422.03	0.1430
22.77	0.0021	311.37	0.0575	427.06	0.1486
24.28	0.0027	321.50	0.0642	431.82	0.1540
25.76	0.0034	331.36	0.0706	436.85	0.1590
26.99	0.0044	340.95	0.0769	440.58	0.1639
28.23	0.0054	350.39	0.0832	444.16	0.1692
29.46	0.0064	359.01	0.0894	446.44	0.1728
210.57	0.0074	367.90	0.0956	450.23	0.1775

Table 169. Test data for specimen P12A–10

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 173.7 MPa	Ultimate Stress	: 451.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
3.44	0.0002	33.42	0.0184	389.90	0.1373
7.41	0.0003	33.65	0.0198	397.83	0.1475
12.74	0.0006	34.18	0.0213	406.72	0.1579
18.50	0.0009	253.86	0.0303	412.03	0.1683
22.00	0.0016	270.41	0.0401	418.86	0.1790
24.27	0.0025	284.68	0.0498	425.54	0.1895
25.94	0.0037	299.78	0.0596	430.92	0.2022
27.13	0.0050	313.71	0.0691	434.58	0.2124
28.38	0.0065	326.74	0.0786	438.78	0.2252
29.24	0.0080	339.64	0.0882	442.71	0.2352
30.02	0.0095	350.94	0.0979	443.95	0.2496
30.66	0.0110	362.73	0.1075	448.37	0.2613
31.29	0.0125	371.63	0.1173	449.47	0.2781
31.82	0.0141	381.21	0.1273	450.43	0.2969
32.68	0.0170				

Table 170. Test data for specimen P12A–11

Test Number	: MEA Test	Test Temp.	: 290℃
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 180.7 MPa	Ultimate Stress	: 457.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
25.23	0.0002	208.29	0.0076	396.45	0.1291
49.09	0.0002	212.70	0.0083	404.31	0.1391
75.36	0.0003	227.73	0.0120	412.10	0.1491
104.94	0.0005	249.11	0.0217	419.55	0.1594
136.45	0.0006	267.24	0.0311	425.89	0.1698
154.03	0.0011	284.20	0.0409	431.89	0.1805
167.96	0.0016	300.06	0.0501	437.54	0.1914
177.20	0.0022	313.78	0.0594	441.82	0.2009
181.61	0.0030	327.50	0.0690	446.99	0.2133
186.02	0.0038	342.95	0.0802	449.33	0.2265
190.50	0.0045	355.01	0.0905	452.78	0.2358
194.91	0.0053	367.56	0.1003	454.71	0.2503
199.40	0.0060	376.59	0.1095	457.05	0.2700
203.81	0.0068	387.14	0.1193		

Table 171. Test data for specimen P12T–12

Test Number	: 065	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 194.9 MPa	Ultimate Stress	: 472.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	285.06	0.0185	418.11	0.1059
160.70	0.0008	292.20	0.0220	428.42	0.1152
177.07	0.0011	300.36	0.0263	433.66	0.1203
193.08	0.0017	307.97	0.0307	442.72	0.1305
203.09	0.0021	314.18	0.0343	447.23	0.1357
210.49	0.0023	323.99	0.0404	451.05	0.1407
218.79	0.0026	333.07	0.0464	455.25	0.1471
227.36	0.0029	340.93	0.0516	459.15	0.1535
236.13	0.0034	349.86	0.0578	462.72	0.1593
243.53	0.0044	358.15	0.0636	465.26	0.1645
251.71	0.0063	366.79	0.0696	468.03	0.1708
257.38	0.0079	375.95	0.0760	470.67	0.1769
264.33	0.0101	383.11	0.0814	472.16	0.1833
271.72	0.0127	402.11	0.0953	472.69	0.1882
278.71	0.0157				

Table 172. Test data for specimen P14A–22

Test Number	: 071	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 185.3 MPa	Ultimate Stress	: 462.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
142.29	0.0011	322.47	0.0412	416.55	0.1124
162.23	0.0017	331.01	0.0462	420.31	0.1164
175.77	0.0022	334.55	0.0496	424.96	0.1213
184.78	0.0027	340.61	0.0541	431.85	0.1305
190.30	0.0030	346.03	0.0576	437.80	0.1393
216.79	0.0042	353.29	0.0630	444.69	0.1490
233.27	0.0049	359.55	0.0672	447.63	0.1541
239.75	0.0057	366.71	0.0723	452.41	0.1637
248.93	0.0073	375.77	0.0794	455.58	0.1686
256.89	0.0089	380.67	0.0837	456.88	0.1728
263.22	0.0108	386.30	0.0883	458.33	0.1776
282.83	0.0181	393.80	0.0928	458.58	0.1816
291.04	0.0212	401.42	0.0983	458.98	0.1878
306.67	0.0297	406.60	0.1025	462.34	0.1927
315.65	0.0350	411.50	0.1075		

Table 173. Test data for specimen P14A–23

Test Number	: 064	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 198.6 MPa	Ultimate Stress	: 475.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.24	0.0000	316.66	0.0340	447.88	0.1415
148.36	0.0016	324.27	0.0398	452.09	0.1475
161.13	0.0020	330.13	0.0437	454.13	0.1521
185.08	0.0030	343.05	0.0524	459.21	0.1600
204.59	0.0038	352.07	0.0583	462.25	0.1658
215.64	0.0042	363.77	0.0665	466.48	0.1752
229.77	0.0047	375.32	0.0748	468.66	0.1843
244.59	0.0067	385.61	0.0825	468.90	0.1843
255.32	0.0088	394.27	0.0894	471.80	0.1906
265.90	0.0116	403.49	0.0969	473.42	0.1963
272.58	0.0140	414.95	0.1041	474.30	0.2015
281.96	0.0175	417.78	0.1069	475.25	0.2054
292.48	0.0222	423.95	0.1128	475.29	0.2100
300.49	0.0260	433.53	0.1236	475.57	0.2145
307.67	0.0301	443.46	0.1351		

Table 174. Test data for specimen P13T–08

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 167.3 MPa	Ultimate Stress	: 502.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
34.13	0.0002	247.25	0.0129	431.61	0.1201
52.61	0.0004	251.59	0.0141	441.20	0.1294
74.05	0.0005	256.00	0.0151	448.78	0.1388
99.28	0.0007	279.17	0.0226	456.50	0.1487
119.07	0.0012	300.68	0.0317	463.40	0.1586
135.55	0.0017	318.47	0.0402	470.98	0.1697
151.27	0.0023	335.29	0.0491	477.26	0.1807
165.13	0.0031	350.46	0.0577	482.08	0.1909
178.16	0.0040	364.53	0.0665	486.70	0.2012
193.12	0.0056	377.42	0.0752	491.25	0.2116
208.08	0.0072	389.83	0.0841	494.29	0.2223
223.11	0.0089	401.48	0.0930	497.66	0.2331
237.46	0.0105	412.44	0.1019	500.01	0.2441
241.52	0.0116	422.44	0.1109	501.52	0.2545

Table 175. Test data for specimen P13A–08

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 162.9 MPa	Ultimate Stress	: 485.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
19.93	0.0000	278.96	0.0272	438.09	0.1479
91.98	0.0007	284.34	0.0297	443.88	0.1556
125.97	0.0015	291.92	0.0330	448.92	0.1638
150.86	0.0027	297.58	0.0362	454.50	0.1730
173.20	0.0041	315.23	0.0457	460.16	0.1829
197.60	0.0058	333.29	0.0564	464.71	0.1923
219.46	0.0075	349.84	0.0673	468.43	0.2018
227.80	0.0095	366.11	0.0785	471.81	0.2109
236.77	0.0117	380.66	0.0894	474.64	0.2201
243.73	0.0137	392.86	0.1005	477.46	0.2300
250.62	0.0161	403.48	0.1102	479.88	0.2401
256.69	0.0185	411.69	0.1177	481.25	0.2507
263.52	0.0207	418.58	0.1251	484.43	0.2617
269.45	0.0229	425.41	0.1329	484.29	0.2730
274.00	0.0251	431.89	0.1401	485.39	0.2854

Table 176. Test data for specimen 683–40

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 274.1 MPa	Ultimate Stress	: 530.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
26.89	0.0002	303.23	0.0074	481.12	0.2244
66.60	0.0003	329.64	0.0206	486.84	0.2387
88.67	0.0004	349.70	0.0356	490.22	0.2528
111.90	0.0005	365.63	0.0507	496.49	0.2669
139.89	0.0006	380.04	0.0658	503.11	0.2809
163.96	0.0007	392.93	0.0807	504.56	0.2948
191.33	0.0009	405.41	0.0954	508.70	0.3086
217.12	0.0012	417.06	0.1099	511.80	0.3223
238.28	0.0017	426.58	0.1244	515.87	0.3357
257.11	0.0023	437.75	0.1389	518.83	0.3489
270.07	0.0030	443.75	0.1532	520.21	0.3620
279.03	0.0038	452.99	0.1675	523.73	0.3746
286.27	0.0046	460.23	0.1818	524.48	0.3869
292.96	0.0054	466.84	0.1961	527.93	0.3983
298.75	0.0064	475.53	0.2104	528.55	0.4082

Table 177. Test data for specimen 683–41

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 279.4 MPa	Ultimate Stress	: 517.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
45.37	0.0002	299.92	0.0106	457.61	0.1693
65.43	0.0003	304.06	0.0122	462.16	0.1802
86.67	0.0004	327.43	0.0266	469.67	0.1913
109.49	0.0005	345.08	0.0408	475.81	0.2026
136.59	0.0007	357.15	0.0538	482.91	0.2138
163.82	0.0008	370.46	0.0664	486.01	0.2253
192.16	0.0009	383.00	0.0785	493.60	0.2369
219.60	0.0011	392.59	0.0903	496.35	0.2487
246.63	0.0014	405.55	0.1020	501.87	0.2609
264.41	0.0020	415.48	0.1136	505.66	0.2733
276.48	0.0030	424.30	0.1249	508.83	0.2860
285.17	0.0044	432.58	0.1362	511.66	0.2993
291.03	0.0059	440.16	0.1473	512.97	0.3132
295.03	0.0074	450.16	0.1583	514.07	0.3290
298.61	0.0090				

Table 178. Test data for specimen 683-33

Test Number	: 206	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 263.1 MPa	Ultimate Stress	: 502.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.277	0.0001	351.581	0.0596	443.121	0.1839
59.946	0.0004	363.526	0.0726	466.461	0.2323
70.662	0.0005	365.541	0.0747	467.452	0.2344
167.215	0.0011	376.495	0.0875	471.522	0.2452
179.868	0.0012	378.511	0.0896	472.586	0.2473
240.869	0.0023	386.982	0.1002	479.712	0.2668
247.815	0.0027	409.652	0.1302	484.443	0.2821
316.452	0.0264	411.134	0.1323	490.510	0.3043
319.288	0.0287	412.518	0.1344	492.891	0.3156
334.245	0.0421	439.657	0.1776	501.585	0.3781
336.620	0.0443	440.721	0.1797	502.266	0.4007

Table 179. Test data for specimen 684-31

Test Number	: 207	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 269.2 MPa	Ultimate Stress	: 531.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.603	0.0001	360.080	0.0352	481.976	0.1438
28.245	0.0002	394.218	0.0583	497.647	0.1677
49.499	0.0004	397.019	0.0604	499.002	0.1699
92.316	0.0007	405.249	0.0667	511.484	0.1944
186.523	0.0014	425.612	0.0834	512.452	0.1966
197.849	0.0016	435.013	0.0918	516.370	0.2057
227.787	0.0022	437.819	0.0943	519.660	0.2149
283.764	0.0054	455.309	0.1119	525.563	0.2349
289.304	0.0062	463.055	0.1204	527.208	0.2420
312.856	0.0119	468.522	0.1268	527.595	0.2444
349.219	0.0289	470.375	0.1289	531.369	0.2795

Table 180. Test data for specimen 68-145

Test Number	: 208	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 278.0 MPa	Ultimate Stress	: 566.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.767	0.0001	407.302	0.0596	511.435	0.1588
27.509	0.0002	410.232	0.0616	517.459	0.1669
138.852	0.0009	418.155	0.0676	530.809	0.1873
218.478	0.0017	439.177	0.0842	532.014	0.1893
245.500	0.0023	448.344	0.0922	535.628	0.1955
253.019	0.0026	455.192	0.0981	547.436	0.2182
319.555	0.0106	478.504	0.1208	550.183	0.2245
325.097	0.0125	480.605	0.1228	551.677	0.2281
341.088	0.0190	488.109	0.1307	560.737	0.2534
371.687	0.0356	489.940	0.1327	562.328	0.2599
384.323	0.0436	495.097	0.1387	566.376	0.2892

Table 181. Test data for specimen 684–21

Test Number	: 122	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 304.5 MPa	Ultimate Stress	: 614.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.20	0.0000	383.48	0.0356	514.78	0.1775
43.86	0.0001	405.09	0.0528	542.52	0.2325
201.61	0.0025	428.57	0.0739	565.75	0.2918
299.97	0.0052	459.36	0.1004	581.42	0.3475
323.03	0.0077	473.99	0.1162	599.71	0.4324
331.67	0.0093	478.54	0.1220	609.92	0.5201
342.81	0.0127	484.63	0.1342	614.05	0.5901
358.17	0.0193				

Table 182. Test data for specimen 684–22

Test Number	: 123	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 281.0 MPa	Ultimate Stress	: 571.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.20	0.0000	322.48	0.0097	485.20	0.1852
32.30	0.0000	334.82	0.0140	485.89	0.1852
205.66	0.0020	353.54	0.0251	511.51	0.2517
206.25	0.0020	386.11	0.0506	539.46	0.3421
222.40	0.0022	420.65	0.0852	560.89	0.4697
279.06	0.0038	450.14	0.1178	570.53	0.5504
297.49	0.0050	466.83	0.1429	571.22	0.6435
311.09	0.0069	478.09	0.1629		

Table 183. Test data for specimen 682–41

Test Number	: 168	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 305.7 MPa	Ultimate Stress	: 621.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	379.18	0.0145	509.61	0.0980
232.61	0.0017	401.78	0.0249	539.21	0.1225
291.45	0.0031	434.95	0.0420	570.81	0.1592
306.61	0.0036	464.96	0.0635	607.20	0.2236
331.78	0.0054	488.25	0.0806	621.00	0.2783
354.04	0.0084				

Table 184. Test data for specimen 684–39

Test Number	: 164	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 358.2 MPa	Ultimate Stress	: 614.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	416.93	0.0133	532.08	0.1137
69.76	0.0001	434.07	0.0200	566.06	0.1636
298.81	0.0030	457.04	0.0334	595.24	0.2291
347.64	0.0044	477.88	0.0502	612.83	0.3099
379.70	0.0067	495.73	0.0735	614.44	0.3387
400.70	0.0092				

Table 185. Test data for specimen 68–264

Test Number	: 165	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 296.2 MPa	Ultimate Stress	: 572.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	355.60	0.0183	447.85	0.1035
261.43	0.0032	355.90	0.0183	467.97	0.1347
291.16	0.0046	363.44	0.0228	491.74	0.1833
306.26	0.0058	376.07	0.0319	503.84	0.2217
315.94	0.0068	391.55	0.0442	535.15	0.3130
325.70	0.0085	410.68	0.0621	563.65	0.4398
336.88	0.0111	432.03	0.0853	572.53	0.5390
345.85	0.0141				

Table 186. Test data for specimen 681-28

Test Number	: 287	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 326.9 MPa	Ultimate Stress	: 640.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
13.740	0.0001	440.890	0.0401	568.650	0.1798
16.160	0.0000	446.950	0.0444	576.090	0.1926
73.320	0.0005	476.220	0.0679	577.180	0.1947
84.350	0.0005	478.690	0.0700	594.630	0.2288
133.140	0.0008	481.040	0.0721	600.430	0.2418
222.700	0.0014	512.890	0.1038	613.920	0.2763
286.290	0.0024	522.170	0.1144	619.030	0.2915
346.130	0.0052	523.880	0.1165	628.870	0.3265
370.930	0.0084	538.910	0.1354	633.110	0.3442
392.980	0.0143	548.160	0.1481	634.720	0.3532
412.490	0.0229	567.410	0.1777	640.200	0.4019

Table 187. Test data for specimen 681-29

Test Number	: 288	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 303.7 MPa	Ultimate Stress	: 608.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.690	0.0001	440.540	0.0508	568.460	0.2131
70.570	0.0002	456.880	0.0634	580.810	0.2443
131.820	0.0005	482.840	0.0866	588.550	0.2679
241.370	0.0014	491.090	0.0952	589.270	0.2703
251.140	0.0016	501.010	0.1060	590.700	0.2751
292.890	0.0028	523.550	0.1343	599.450	0.3102
299.860	0.0030	525.140	0.1365	601.830	0.3226
354.120	0.0085	534.260	0.1497	602.240	0.3247
387.160	0.0193	547.790	0.1720	605.580	0.3470
391.690	0.0214	550.470	0.1766	606.700	0.3572
434.680	0.0465	555.190	0.1856	608.430	0.3845

Table 188. Test data for specimen 68-230

Test Number	: 289	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 294.3 MPa	Ultimate Stress	: 578.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
17.980	0.0001	391.280	0.0327	521.840	0.1759
23.600	0.0001	394.710	0.0350	524.540	0.1805
119.640	0.0005	430.170	0.0623	541.250	0.2125
170.980	0.0008	432.620	0.0646	542.450	0.2148
183.760	0.0009	435.270	0.0669	552.460	0.2387
196.100	0.0010	454.540	0.0862	554.310	0.2434
296.600	0.0036	469.050	0.1023	561.180	0.2612
302.200	0.0040	471.040	0.1046	567.420	0.2793
327.610	0.0067	497.960	0.1395	571.500	0.2959
334.490	0.0079	501.210	0.1440	575.950	0.3158
376.020	0.0236	508.950	0.1554	578.850	0.3491

Table 189. Test data for specimen 682–25

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 5780 h
Yield Stress	: 281.5 MPa	Ultimate Stress	: 601.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
40.06	0.0002	324.67	0.0088	557.37	0.2780
59.43	0.0004	331.43	0.0102	564.20	0.3001
80.88	0.0005	335.50	0.0117	572.20	0.3227
105.70	0.0006	376.94	0.0359	577.02	0.3452
130.38	0.0008	406.03	0.0600	582.47	0.3684
156.92	0.0010	431.40	0.0832	588.19	0.3922
183.95	0.0011	451.40	0.1054	591.98	0.4165
211.67	0.0014	469.40	0.1272	593.29	0.4412
235.39	0.0019	487.53	0.1487	595.22	0.4669
255.86	0.0025	501.80	0.1702	596.60	0.4932
274.20	0.0033	515.38	0.1914	599.29	0.5203
288.06	0.0042	527.93	0.2129	599.02	0.5484
300.40	0.0051	538.76	0.2343	600.67	0.5775
309.78	0.0062	548.41	0.2560	598.74	0.6072
318.12	0.0075				

Table 190. Test data for specimen 682–26

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 5780 h
Yield Stress	: 294.8 MPa	Ultimate Stress	: 599.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
39.02	0.0002	321.43	0.0059	546.20	0.2054
58.33	0.0003	330.19	0.0070	554.06	0.2226
78.26	0.0004	336.60	0.0081	563.03	0.2402
100.25	0.0005	342.26	0.0091	567.65	0.2580
123.90	0.0007	385.07	0.0281	573.37	0.2762
150.37	0.0008	411.55	0.0472	578.61	0.2947
178.71	0.0009	434.09	0.0658	582.47	0.3139
208.57	0.0011	454.64	0.0839	586.47	0.3334
233.66	0.0014	474.22	0.1017	590.74	0.3538
253.24	0.0019	488.98	0.1192	593.43	0.3747
272.62	0.0025	504.42	0.1367	595.09	0.3967
288.41	0.0033	515.04	0.1538	597.15	0.4199
301.44	0.0041	525.59	0.1710	596.33	0.4447
314.13	0.0049	538.20	0.1882	597.78	0.4715

Table 191. Test data for specimen 684–06

Test Number	: 124	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 264.5 MPa	Ultimate Stress	: 606.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.91	0.0002	329.49	0.0112	480.34	0.1036
194.98	0.0024	348.32	0.0163	485.57	0.1118
219.11	0.0030	362.95	0.0227	520.34	0.1500
255.25	0.0039	383.50	0.0335	551.99	0.1962
280.26	0.0050	398.95	0.0434	571.40	0.2367
280.51	0.0049	422.46	0.0602	588.76	0.2865
297.62	0.0062	450.71	0.0811	601.37	0.3393
313.10	0.0081	470.92	0.0973	606.46	0.3925

Table 192. Test data for specimen 684–07

Test Number	: 137	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 299.7 MPa	Ultimate Stress	: 601.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.20	0.0000	359.88	0.0124	483.99	0.0926
44.00	0.0001	379.74	0.0188	525.48	0.1305
207.78	0.0024	402.32	0.0293	552.96	0.1719
282.94	0.0040	426.63	0.0448	581.43	0.2267
320.64	0.0062	452.65	0.0638	592.69	0.2652
341.11	0.0084	475.82	0.0818	601.06	0.3150

Table 193. Test data for specimen 684–08

Test Number	: 223	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 296.8 MPa	Ultimate Stress	: 612.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
39.27	0.0000	425.98	0.0489	562.39	0.1853
61.70	0.0001	444.80	0.0611	573.01	0.2054
132.87	0.0006	465.05	0.0758	575.27	0.2099
168.93	0.0009	470.32	0.0801	580.15	0.2208
224.62	0.0016	482.95	0.0904	585.60	0.2340
241.26	0.0020	494.42	0.1006	589.42	0.2452
286.33	0.0027	498.72	0.1047	593.91	0.2585
322.46	0.0064	509.40	0.1152	594.69	0.2607
333.59	0.0084	513.34	0.1194	597.78	0.2717
355.79	0.0143	524.74	0.1321	602.34	0.2898
361.40	0.0163	533.63	0.1427	602.70	0.2921
366.72	0.0183	536.90	0.1469	605.66	0.3057
371.80	0.0203	544.67	0.1577	608.51	0.3242
393.42	0.0304	547.74	0.1620	610.47	0.3403
401.42	0.0345	554.71	0.1726	611.19	0.3495
419.31	0.0448	557.45	0.1768	612.03	0.3657

Table 194. Test data for specimen 68–129

Test Number	: 127	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 287.6 MPa	Ultimate Stress	: 595.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
43.56	0.0000	383.46	0.0300	545.42	0.2116
196.46	0.0017	400.23	0.0420	568.01	0.2740
223.72	0.0021	424.12	0.0606	585.78	0.3478
284.67	0.0036	446.75	0.0807	594.05	0.4167
319.09	0.0060	468.20	0.0978	594.45	0.4169
332.24	0.0080	480.50	0.1101	595.56	0.4226
345.83	0.0080	489.89	0.1261	595.46	0.4220
358.73	0.0164	515.18	0.1569	595.81	0.5039

Table 195. Test data for specimen 684–10

Test Number	: 191	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 299.0 MPa	Ultimate Stress	: 652.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
9.42	0.0000	412.04	0.0253	581.43	0.1448
34.71	0.0002	426.38	0.0319	596.07	0.1630
99.40	0.0006	456.56	0.0478	601.13	0.1699
136.72	0.0009	464.56	0.0524	604.28	0.1745
234.34	0.0018	468.30	0.0547	615.26	0.1922
244.35	0.0020	497.14	0.0731	619.10	0.1992
253.55	0.0022	507.17	0.0799	621.48	0.2038
269.99	0.0027	513.66	0.0844	629.89	0.2217
277.38	0.0029	533.80	0.1000	633.66	0.2317
332.95	0.0061	542.24	0.1068	639.49	0.2485
346.27	0.0075	544.86	0.1090	640.42	0.2505
351.98	0.0083	547.56	0.1113	642.60	0.2585
356.97	0.0090	551.92	0.1155	643.09	0.2606
363.36	0.0101	571.03	0.1335	647.38	0.2789
368.95	0.0113	575.28	0.1380	647.45	0.2809
406.56	0.0229	577.47	0.1403	652.75	0.3335

Table 196. Test data for specimen 684–11

Test Number	: 192	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 281.1 MPa	Ultimate Stress	: 628.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
9.95	0.0001	480.97	0.0878	587.05	0.2655
38.08	0.0002	485.35	0.0921	589.00	0.2721
59.45	0.0003	498.90	0.1071	595.44	0.2918
153.78	0.0008	502.77	0.1113	597.82	0.3006
202.98	0.0012	519.28	0.1323	601.95	0.3161
265.79	0.0028	529.92	0.1473	602.88	0.3205
279.07	0.0034	534.16	0.1538	608.88	0.3449
327.92	0.0065	543.50	0.1691	609.68	0.3493
340.30	0.0079	554.33	0.1886	615.00	0.3761
379.05	0.0170	556.39	0.1930	615.87	0.3806
393.50	0.0230	557.77	0.1951	616.30	0.3828
401.83	0.0272	564.88	0.2104	619.10	0.4007
425.91	0.0418	567.95	0.2169	621.06	0.4141
429.22	0.0439	574.55	0.2326	621.50	0.4185
439.73	0.0515	576.44	0.2370	624.75	0.4452
458.10	0.0665	579.07	0.2436	628.10	0.4976
462.98	0.0708	585.41	0.2610		

Table 197. Test data for specimen 68–139

Test Number	: 193	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 287.4 MPa	Ultimate Stress	: 639.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.50	0.0001	430.18	0.0356	590.30	0.1636
79.76	0.0006	434.81	0.0378	598.00	0.1749
163.03	0.0011	460.58	0.0515	601.84	0.1813
198.39	0.0014	468.51	0.0561	607.28	0.1913
255.48	0.0025	490.56	0.0697	610.59	0.1974
270.00	0.0030	500.67	0.0766	619.13	0.2155
283.13	0.0036	519.54	0.0903	621.46	0.2216
319.14	0.0058	539.11	0.1063	626.71	0.2354
326.46	0.0064	544.20	0.1109	628.58	0.2415
339.28	0.0078	557.24	0.1238	629.28	0.2435
372.47	0.0138	561.93	0.1284	633.18	0.2579
378.08	0.0153	563.95	0.1308	633.52	0.2599
383.14	0.0168	565.68	0.1327	633.89	0.2620
389.09	0.0187	575.40	0.1440	635.40	0.2684
394.44	0.0205	578.95	0.1483	635.76	0.2704
425.35	0.0333	587.76	0.1596	638.85	0.2963

Table 198. Test data for specimen 682–16

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 294.1 MPa	Ultimate Stress	: 657.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
19.10	0.0002	323.71	0.0054	601.98	0.2667
21.24	0.0002	331.16	0.0063	611.36	0.2940
38.61	0.0002	342.95	0.0072	617.01	0.3216
57.09	0.0003	350.46	0.0081	624.87	0.3493
79.36	0.0004	407.27	0.0300	631.35	0.3774
105.08	0.0005	441.06	0.0529	635.42	0.4055
130.66	0.0007	468.71	0.0749	639.08	0.4341
158.72	0.0008	495.53	0.0966	643.14	0.4627
191.54	0.0010	519.59	0.1185	646.04	0.4916
219.18	0.0012	537.72	0.1408	649.28	0.5206
242.01	0.0017	555.17	0.1640	651.76	0.5497
261.66	0.0022	570.75	0.1881	652.73	0.5789
280.34	0.0029	584.74	0.2136	653.97	0.6084
295.65	0.0036	595.78	0.2397	654.86	0.6382
310.82	0.0045				

Table 199. Test data for specimen 682–17

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 289.8 MPa	Ultimate Stress	: 629.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
39.16	0.0002	322.88	0.0075	570.47	0.2032
60.54	0.0002	326.81	0.0085	577.78	0.2165
79.15	0.0003	358.87	0.0204	586.61	0.2300
102.66	0.0004	381.21	0.0337	592.05	0.2434
126.86	0.0005	401.07	0.0468	598.95	0.2570
154.10	0.0006	420.79	0.0599	603.15	0.2705
180.09	0.0007	438.51	0.0727	607.50	0.2839
206.91	0.0009	455.95	0.0856	614.46	0.2973
234.63	0.0012	472.70	0.0985	615.70	0.3105
257.04	0.0016	487.39	0.1114	618.11	0.3233
272.76	0.0022	502.97	0.1244	622.67	0.3361
285.58	0.0029	516.90	0.1374	623.42	0.3482
296.13	0.0037	528.07	0.1505	625.97	0.3602
305.58	0.0046	540.20	0.1635	626.04	0.3717
312.06	0.0055	551.44	0.1767	628.25	0.3824
318.54	0.0065	561.51	0.1899		

Table 200. Test data for specimen 682–15

Test Number	: 125	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 313.4 MPa	Ultimate Stress	: 641.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
48.61	0.0003	426.81	0.0265	545.48	0.1063
194.81	0.0025	450.59	0.0376	580.02	0.1369
229.86	0.0032	475.06	0.0526	600.75	0.1625
307.85	0.0052	479.75	0.0561	623.67	0.2002
354.53	0.0084	485.66	0.0635	629.45	0.2148
385.15	0.0131	508.43	0.0787	638.11	0.2498
404.35	0.0184	545.28	0.1038	640.98	0.2785

Table 201. Test data for specimen 682–22

Test Number	: 126	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 299.3 MPa	Ultimate Stress	: 650.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
33.34	0.0000	390.58	0.0178	559.42	0.1414
204.82	0.0018	401.82	0.0220	591.94	0.1803
218.93	0.0021	422.99	0.0333	614.57	0.2202
285.41	0.0040	449.59	0.0501	614.27	0.2202
322.45	0.0058	470.96	0.0666	636.06	0.2756
348.30	0.0084	483.35	0.0783	647.26	0.3307
372.86	0.0131	526.76	0.1082	650.39	0.3705

Table 202. Test data for specimen 682–23

Test Number	: 229	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 306.0 MPa	Ultimate Stress	: 657.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
17.77	0.0001	461.40	0.0430	601.42	0.1524
90.70	0.0004	469.39	0.0475	608.18	0.1611
189.83	0.0008	488.52	0.0585	617.09	0.1742
256.81	0.0017	492.15	0.0608	624.19	0.1852
265.69	0.0019	509.41	0.0718	630.09	0.1962
273.92	0.0022	525.21	0.0828	631.33	0.1984
289.49	0.0027	542.89	0.0959	635.60	0.2072
321.44	0.0041	556.44	0.1068	640.22	0.2182
340.09	0.0054	559.13	0.1090	641.05	0.2204
347.25	0.0060	568.84	0.1177	645.29	0.2314
381.41	0.0111	571.11	0.1199	647.48	0.2382
387.43	0.0125	573.48	0.1221	650.64	0.2494
392.67	0.0140	584.31	0.1329	652.99	0.2584
398.48	0.0158	586.42	0.1351	654.91	0.2693
425.12	0.0256	588.40	0.1372	655.36	0.2715
434.90	0.0299	597.82	0.1481	656.58	0.2806
444.28	0.0343	599.62	0.1502	657.39	0.2942

Table 203. Test data for specimen 68–119

Test Number	: 128	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 306.0 MPa	Ultimate Stress	: 624.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	422.97	0.0206	587.81	0.1922
195.52	0.0016	443.47	0.0336	604.31	0.2298
240.17	0.0021	473.25	0.0576	617.67	0.2781
386.78	0.0049	479.42	0.0625	622.63	0.3245
389.99	0.0052	486.10	0.0718	624.26	0.3521
392.85	0.0064	536.68	0.1179	615.88	0.3758
393.10	0.0066	560.09	0.1484		

Table 204. Test data for specimen 681–04

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 291.3 MPa	Ultimate Stress	: 653.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
18.00	0.0000	338.67	0.0064	593.22	0.1786
45.57	0.0003	348.32	0.0072	599.09	0.1921
65.85	0.0004	356.80	0.0079	606.88	0.2058
86.53	0.0005	401.55	0.0172	612.94	0.2193
110.52	0.0007	430.30	0.0287	617.98	0.2332
137.41	0.0009	454.50	0.0405	623.22	0.2472
163.75	0.0011	475.32	0.0526	626.94	0.2612
190.50	0.0014	493.25	0.0646	632.46	0.2753
214.84	0.0017	508.01	0.0768	634.80	0.2896
237.25	0.0022	521.80	0.0889	638.32	0.3040
256.62	0.0027	534.83	0.1012	641.28	0.3185
274.14	0.0032	548.27	0.1137	642.45	0.3331
291.30	0.0038	559.30	0.1263	645.14	0.3477
306.61	0.0044	565.99	0.1392	646.66	0.3626
317.16	0.0051	577.99	0.1521	648.87	0.3777

Table 205. Test data for specimen 681–05

Test Number	: MEA Test	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 309.4 MPa	Ultimate Stress	: 632.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
61.16	0.0003	351.08	0.0071	554.41	0.1045
86.60	0.0004	380.66	0.0122	562.82	0.1108
114.94	0.0005	405.41	0.0187	570.06	0.1172
142.79	0.0007	422.30	0.0254	576.95	0.1236
172.16	0.0008	437.89	0.0323	583.57	0.1299
200.29	0.0010	453.47	0.0391	589.36	0.1363
225.80	0.0012	466.64	0.0459	596.47	0.1428
247.66	0.0015	477.19	0.0526	600.95	0.1493
267.72	0.0020	489.11	0.0592	605.64	0.1559
283.10	0.0024	501.39	0.0657	611.84	0.1626
298.06	0.0029	510.07	0.0723	614.94	0.1692
309.51	0.0035	520.35	0.0788	619.49	0.1759
320.61	0.0042	530.41	0.0852	623.29	0.1827
337.43	0.0056	537.93	0.0916	627.70	0.1895
348.12	0.0064	547.86	0.0980	628.59	0.1964

Table 206. Test data for specimen 683–42

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 162.7 MPa	Ultimate Stress	: 397.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
66.74	0.0005	204.43	0.0170	341.29	0.1304
95.91	0.0007	206.91	0.0184	348.12	0.1387
121.28	0.0011	217.87	0.0268	355.36	0.1485
141.20	0.0017	230.77	0.0362	362.39	0.1574
155.20	0.0025	243.04	0.0452	365.28	0.1656
165.61	0.0034	254.21	0.0541	370.87	0.1751
174.16	0.0045	266.96	0.0628	374.32	0.1846
179.82	0.0057	277.72	0.0716	380.45	0.1919
183.88	0.0069	288.75	0.0799	385.42	0.2031
187.40	0.0083	297.03	0.0883	389.55	0.2146
191.81	0.0097	307.51	0.0968	389.21	0.2235
192.36	0.0110	316.33	0.1056	394.04	0.2372
195.88	0.0125	324.67	0.1137	394.93	0.2498
197.40	0.0139	332.81	0.1218	394.93	0.2639
200.22	0.0154				

Table 207. Test data for specimen 684–40

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 156.4 MPa	Ultimate Stress	: 412.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
43.02	0.0003	190.57	0.0142	336.12	0.1472
64.33	0.0005	192.29	0.0156	343.15	0.1580
86.32	0.0006	193.81	0.0169	353.22	0.1695
105.15	0.0008	210.01	0.0273	359.91	0.1806
123.28	0.0013	226.77	0.0386	367.42	0.1917
137.96	0.0019	238.63	0.0497	372.73	0.2029
150.44	0.0027	250.97	0.0608	379.28	0.2128
158.86	0.0037	264.83	0.0718	383.56	0.2248
165.89	0.0048	275.58	0.0831	390.17	0.2380
172.37	0.0060	287.51	0.0942	395.83	0.2510
175.61	0.0074	296.27	0.1044	397.90	0.2655
177.88	0.0087	308.68	0.1151	402.45	0.2749
181.88	0.0101	316.68	0.1264	403.34	0.2882
186.16	0.0115	328.26	0.1382	410.10	0.3068
188.23	0.0128				

Table 208. Test data for specimen 684-32

Test Number	: 251	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 149.5 MPa	Ultimate Stress	: 333.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
38.035	0.0002	189.629	0.0321	272.081	0.1269
40.376	0.0002	202.477	0.0452	281.043	0.1400
55.969	0.0001	208.233	0.0515	286.391	0.1465
65.557	0.0002	210.259	0.0535	288.174	0.1488
105.987	0.0005	225.677	0.0709	299.143	0.1662
115.819	0.0006	227.751	0.0731	302.679	0.1705
123.596	0.0007	233.046	0.0794	314.764	0.1903
147.480	0.0023	245.258	0.0938	318.349	0.2002
152.702	0.0035	250.596	0.1005	325.917	0.2151
164.710	0.0099	265.256	0.1182	326.063	0.2174
180.375	0.0231	267.287	0.1204	333.170	0.2438

Table 209. Test data for specimen 684-33

Test Number	: 250	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 155.0 MPa	Ultimate Stress	: 399.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
36.630	0.0002	224.300	0.0528	332.150	0.1663
68.620	0.0002	231.820	0.0592	343.890	0.1839
78.580	0.0002	250.800	0.0768	347.800	0.1906
106.320	0.0004	253.250	0.0791	350.210	0.1930
115.570	0.0004	260.060	0.0855	368.870	0.2534
135.860	0.0007	279.690	0.1053	377.750	0.2736
143.790	0.0012	285.970	0.1119	380.670	0.2804
164.580	0.0058	302.170	0.1296	388.490	0.3070
190.810	0.0240	303.820	0.1316	390.300	0.3095
199.110	0.0307	311.800	0.1404	393.670	0.3299
201.240	0.0327	324.840	0.1580	395.710	0.3364

Table 210. Test data for specimen 68-246

Test Number	: 249	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 170.6 MPa	Ultimate Stress	: 390.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
41.940	0.0002	209.810	0.0183	326.070	0.1042
64.890	0.0002	235.910	0.0344	342.730	0.1217
75.350	0.0003	245.360	0.0407	348.040	0.1283
117.050	0.0004	248.310	0.0430	363.210	0.1487
126.570	0.0005	267.370	0.0561	364.310	0.1508
134.690	0.0006	270.460	0.0583	369.340	0.1576
161.000	0.0016	273.410	0.0605	376.300	0.1708
166.350	0.0022	290.630	0.0734	380.330	0.1794
172.140	0.0029	293.360	0.0755	387.400	0.1999
201.510	0.0138	296.050	0.0777	388.030	0.2019
205.820	0.0160	316.710	0.0954	390.650	0.2221

Table 211. Test data for specimen 684–23

Test Number	: 091	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 173.4 MPa	Ultimate Stress	: 416.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
137.03	0.0009	260.07	0.0280	374.87	0.1304
166.79	0.0017	269.42	0.0354	380.58	0.1373
175.09	0.0022	275.07	0.0400	383.43	0.1413
186.21	0.0035	283.63	0.0476	390.10	0.1497
191.45	0.0045	291.32	0.0545	393.67	0.1555
195.90	0.0055	297.79	0.0619	395.70	0.1583
199.81	0.0064	308.11	0.0690	398.82	0.1641
206.73	0.0072	317.35	0.0771	400.26	0.1673
213.91	0.0081	326.30	0.0847	402.70	0.1721
222.01	0.0093	330.86	0.0889	405.86	0.1791
227.13	0.0101	335.91	0.0934	407.25	0.1823
234.78	0.0114	340.24	0.0972	409.32	0.1862
238.58	0.0132	350.48	0.1044	410.74	0.1903
242.49	0.0148	354.85	0.1088	412.18	0.1934
246.97	0.0181	363.38	0.1176	412.36	0.1993
251.74	0.0216	367.70	0.1221	412.41	0.2025
255.64	0.0245	371.87	0.1266		

Table 212. Test data for specimen 684–24

Test Number	: 092	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 164.4 MPa	Ultimate Stress	: 442.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
131.09	0.0007	264.23	0.0338	395.13	0.1571
161.38	0.0016	268.58	0.0370	399.64	0.1631
170.77	0.0021	292.17	0.0571	406.01	0.1727
177.76	0.0028	299.27	0.0630	408.98	0.1772
184.73	0.0039	305.22	0.0682	410.77	0.1804
188.47	0.0047	310.81	0.0730	414.03	0.1871
191.92	0.0056	315.96	0.0778	423.79	0.2067
195.08	0.0065	318.97	0.0805	425.05	0.2100
198.78	0.0076	337.58	0.0967	429.03	0.2167
201.57	0.0081	344.16	0.1001	430.50	0.2207
207.31	0.0088	350.35	0.1059	431.77	0.2260
236.70	0.0140	355.06	0.1103	432.94	0.2311
241.45	0.0167	363.12	0.1186	435.81	0.2386
246.41	0.0201	365.95	0.1218	437.16	0.2448
251.57	0.0236	371.04	0.1273	439.01	0.2497
256.17	0.0270	354.82	0.1306	439.80	0.2544
260.33	0.0305	391.27	0.1513	442.04	0.2608

Table 213. Test data for specimen 682–40

Test Number	: 178	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 174.3 MPa	Ultimate Stress	: 440.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.25	0.0000	218.20	0.0109	342.51	0.1025
33.32	0.0001	220.60	0.0120	359.89	0.1192
97.41	0.0007	224.95	0.0139	376.72	0.1375
144.41	0.0015	229.50	0.0160	384.74	0.1472
157.94	0.0018	233.25	0.0182	392.24	0.1570
162.85	0.0021	238.24	0.0210	398.80	0.1659
174.78	0.0026	247.78	0.0270	409.88	0.1835
183.14	0.0033	253.92	0.0312	419.01	0.2008
190.60	0.0041	260.91	0.0365	422.18	0.2068
196.45	0.0049	271.49	0.0448	423.13	0.2086
201.35	0.0058	280.12	0.0523	431.34	0.2305
205.71	0.0069	292.09	0.0622	434.92	0.2482
210.26	0.0080	305.66	0.0731	439.19	0.2666
213.01	0.0091	317.23	0.0832	440.78	0.2804
215.71	0.0099	329.89	0.0936	440.83	0.2903

Table 214. Test data for specimen 682–42

Test Number	: 176	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 176.9 MPa	Ultimate Stress	: 451.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.64	0.0000	226.99	0.0137	376.65	0.1316
30.11	0.0000	236.62	0.0188	383.92	0.1396
95.68	0.0005	244.12	0.0235	393.44	0.1529
134.65	0.0010	249.34	0.0268	401.17	0.1631
161.74	0.0017	255.40	0.0306	409.59	0.1740
167.78	0.0020	261.86	0.0360	413.59	0.1799
178.19	0.0025	269.51	0.0415	417.63	0.1861
186.21	0.0031	279.95	0.0497	422.07	0.1929
189.13	0.0034	285.02	0.0538	429.12	0.2062
194.24	0.0040	297.14	0.0634	433.29	0.2175
198.55	0.0047	306.34	0.0708	437.63	0.2318
206.44	0.0062	314.30	0.0777	442.07	0.2430
209.77	0.0071	326.74	0.0880	447.30	0.2585
214.33	0.0085	338.22	0.0975	448.61	0.2688
217.60	0.0097	360.01	0.1145	450.08	0.2851
221.43	0.0112	369.13	0.1240	451.61	0.3043

Table 215. Test data for specimen 68–263

Test Number	: 181	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 165.6 MPa	Ultimate Stress	: 450.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	242.20	0.0266	376.97	0.1490
80.05	0.0003	248.82	0.0312	382.37	0.1557
129.13	0.0010	260.45	0.0401	388.36	0.1647
157.15	0.0019	271.23	0.0491	392.52	0.1710
164.98	0.0022	288.38	0.0639	400.29	0.1824
175.45	0.0027	298.41	0.0723	406.13	0.1928
180.09	0.0031	306.85	0.0799	413.00	0.2067
188.86	0.0039	316.09	0.0880	413.88	0.2070
192.50	0.0045	324.38	0.0952	417.98	0.2174
195.84	0.0051	332.62	0.1006	422.37	0.2266
199.02	0.0058	339.82	0.1078	427.99	0.2419
205.20	0.0072	345.52	0.1134	438.53	0.2735
215.00	0.0109	349.69	0.1175	444.23	0.2983
220.87	0.0135	355.10	0.1231	449.22	0.3216
223.96	0.0151	359.91	0.1288	450.01	0.3315
228.83	0.0178	366.31	0.1352	450.32	0.3464
233.71	0.0207	371.27	0.1413		

Table 216. Test data for specimen 682-28

Test Number	: 319	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 203.3 MPa	Ultimate Stress	: 479.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
95.970	0.0002	311.280	0.0498	422.850	0.1422
118.450	0.0002	318.200	0.0543	428.320	0.1489
155.240	0.0005	338.060	0.0673	431.790	0.1533
162.540	0.0007	341.270	0.0695	442.830	0.1689
204.750	0.0029	359.350	0.0826	455.890	0.1911
210.160	0.0037	378.570	0.0979	457.050	0.1933
228.290	0.0075	381.060	0.1001	464.650	0.2116
264.380	0.0231	390.950	0.1090	466.090	0.2139
268.810	0.0253	404.820	0.1223	466.860	0.2159
281.090	0.0320	407.000	0.1245	473.630	0.2382
300.340	0.0432	409.010	0.1268	478.960	0.2689

Table 217. Test data for specimen 682-29

Test Number	: 320	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 205.3 MPa	Ultimate Stress	: 485.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
18.870	0.0001	301.950	0.0480	418.900	0.1578
33.340	0.0002	305.100	0.0501	428.130	0.1711
68.280	0.0003	319.730	0.0611	443.810	0.1979
78.920	0.0003	338.970	0.0765	449.360	0.2072
90.140	0.0003	351.940	0.0874	459.460	0.2311
133.150	0.0005	354.440	0.0896	463.780	0.2405
142.130	0.0006	375.810	0.1094	472.960	0.2706
196.750	0.0022	377.910	0.1115	476.600	0.2818
239.890	0.0098	388.780	0.1225	480.990	0.3041
258.450	0.0189	398.960	0.1335	482.860	0.3129
262.340	0.0212	417.320	0.1557	485.580	0.3506

Table 218. Test data for specimen 681-30

Test Number	: 318	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 201.3 MPa	Ultimate Stress	: 475.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
112.840	0.0001	329.750	0.0780	430.620	0.1979
119.940	0.0002	342.440	0.0891	443.920	0.2229
149.250	0.0007	344.740	0.0912	445.330	0.2274
168.720	0.0013	371.180	0.1176	457.120	0.2528
180.220	0.0017	373.300	0.1198	455.730	0.2548
244.130	0.0161	383.200	0.1308	464.740	0.2758
248.410	0.0184	396.060	0.1461	463.810	0.2778
252.380	0.0208	403.040	0.1550	466.760	0.2865
292.290	0.0476	404.700	0.1572	470.830	0.3026
295.130	0.0499	422.660	0.1835	471.970	0.3050
306.500	0.0587	429.590	0.1956	475.140	0.3337

Table 219. Test data for specimen 682–27

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 5,780 h
Yield Stress	: 185.1 MPa	Ultimate Stress	: 452.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
36.34	0.0002	213.39	0.0086	389.42	0.1610
57.23	0.0004	216.98	0.0096	396.38	0.1726
77.64	0.0005	220.84	0.0107	404.72	0.1848
98.32	0.0006	241.11	0.0213	411.96	0.1970
117.35	0.0007	257.45	0.0329	416.37	0.2091
136.24	0.0011	273.10	0.0443	423.61	0.2200
150.31	0.0016	289.79	0.0558	427.34	0.2358
162.99	0.0021	301.78	0.0675	430.85	0.2474
174.51	0.0026	316.54	0.0789	436.23	0.2601
185.12	0.0032	327.50	0.0906	442.23	0.2769
190.23	0.0039	340.60	0.1021	444.09	0.2891
198.57	0.0047	349.36	0.1137	447.06	0.3037
203.53	0.0057	360.39	0.1254	449.19	0.3238
207.39	0.0066	370.11	0.1373	450.23	0.3447
209.88	0.0076	378.87	0.1489	450.37	0.3672

Table 220. Test data for specimen 684–09

Test Number	: 082	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 164.3 MPa	Ultimate Stress	: 500.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
112.43	0.0004	319.88	0.0463	451.18	0.1521
136.35	0.0007	330.15	0.0531	458.54	0.1622
153.62	0.0012	338.70	0.0596	462.12	0.1676
188.85	0.0024	345.67	0.0645	465.31	0.1717
199.52	0.0031	369.51	0.0813	474.65	0.1766
216.98	0.0037	377.37	0.0873	477.80	0.1805
234.00	0.0047	385.47	0.0929	479.90	0.1882
240.14	0.0055	392.40	0.0977	482.34	0.1959
244.67	0.0067	399.62	0.1010	487.25	0.2127
248.80	0.0082	407.33	0.1074	492.37	0.2187
254.35	0.0102	416.37	0.1147	494.34	0.2215
283.26	0.0237	433.21	0.1314	494.83	0.2277
293.73	0.0297	438.61	0.1371	495.71	0.2366
305.03	0.0367	442.98	0.1420	497.57	0.2426
315.10	0.0433	447.21	0.1471	500.32	0.2567

Table 221. Test data for specimen 68–130

Test Number	: 083	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 168.9 MPa	Ultimate Stress	: 447.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
122.1500	0.0008	266.7200	0.0244	395.3500	0.1314
138.2200	0.0012	273.6900	0.0296	401.0800	0.1385
155.0300	0.0018	280.2500	0.0342	404.1500	0.1428
160.7000	0.0020	288.5200	0.0407	406.9700	0.1467
166.4700	0.0023	293.2500	0.0446	410.0800	0.1509
177.2300	0.0028	301.2700	0.0509	415.3200	0.1584
180.9800	0.0031	308.6000	0.0572	418.6000	0.1637
195.8000	0.0044	313.6800	0.0614	426.7800	0.1772
203.5800	0.0052	322.4600	0.0688	428.7200	0.1812
212.2400	0.0058	327.7500	0.0732	432.8700	0.1894
221.2100	0.0066	334.3400	0.0790	436.2800	0.1970
230.5300	0.0075	340.1700	0.0837	439.6400	0.2044
234.2100	0.0080	364.9600	0.1007	442.6200	0.2129
237.4900	0.0088	372.2600	0.1067	443.5500	0.2161
240.8200	0.0101	377.6200	0.1124	446.0800	0.2243
254.1300	0.0164	385.2900	0.1207	446.8500	0.2301
260.4000	0.0204	392.7400	0.1281	447.1400	0.2333

Table 222. Test data for specimen 684-12

Test Number	: 236	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 216.0 MPa	Ultimate Stress	: 485.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
64.060	0.0004	227.050	0.0060	386.180	0.0998
93.730	0.0005	259.280	0.0181	389.000	0.1024
103.610	0.0006	272.530	0.0251	409.010	0.1188
125.630	0.0007	277.420	0.0276	421.990	0.1310
132.320	0.0007	301.910	0.0421	442.810	0.1500
138.680	0.0008	306.330	0.0447	443.850	0.1536
163.920	0.0009	318.480	0.0521	460.970	0.1797
172.010	0.0010	347.650	0.0713	462.490	0.1817
179.520	0.0011	357.420	0.0783	472.180	0.1991
203.880	0.0021	360.570	0.0806	477.380	0.2102
221.270	0.0046	383.260	0.0975	485.710	0.2388

Table 223. Test data for specimen 684-15

Test Number	: 261	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 190.4 MPa	Ultimate Stress	: 427.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
28.682	0.0002	242.204	0.0235	354.865	0.1120
35.020	0.0002	245.934	0.0258	369.129	0.1270
61.873	0.0003	266.270	0.0387	374.891	0.1337
72.445	0.0004	275.565	0.0451	376.827	0.1357
128.096	0.0007	278.526	0.0474	391.284	0.1532
134.391	0.0007	298.421	0.0621	392.876	0.1553
151.378	0.0008	301.189	0.0642	397.980	0.1623
190.100	0.0030	322.623	0.0819	410.957	0.1816
195.833	0.0040	325.153	0.0840	414.474	0.1879
211.355	0.0085	327.582	0.0862	421.804	0.2031
230.795	0.0172	348.338	0.1056	427.262	0.2227

Table 224. Test data for specimen 68-140

Test Number	: 244	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 170.2 MPa	Ultimate Stress	: 479.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
44.260	0.0002	281.450	0.0413	416.300	0.1427
48.740	0.0002	309.740	0.0585	428.390	0.1557
94.850	0.0005	313.120	0.0607	430.280	0.1579
104.690	0.0007	322.910	0.0670	435.920	0.1645
161.360	0.0025	350.440	0.0862	447.870	0.1798
166.450	0.0028	353.360	0.0884	452.540	0.1865
174.850	0.0034	356.220	0.0906	461.470	0.2023
223.280	0.0125	383.360	0.1121	462.660	0.2045
229.230	0.0147	385.840	0.1143	471.640	0.2247
244.580	0.0213	388.320	0.1166	473.380	0.2293
270.070	0.0348	409.670	0.1361	479.000	0.2522

Table 225. Test data for specimen 682–18

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 161.3 MPa	Ultimate Stress	: 463.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
78.53	0.0005	213.74	0.0143	391.21	0.1431
102.18	0.0007	234.35	0.0238	398.72	0.1517
121.76	0.0011	251.59	0.0341	409.48	0.1605
138.38	0.0015	262.41	0.0440	415.34	0.1693
149.13	0.0022	280.27	0.0538	424.17	0.1782
160.17	0.0030	292.41	0.0631	428.65	0.1872
169.82	0.0038	305.30	0.0723	434.78	0.1962
178.09	0.0049	318.40	0.0815	441.47	0.2052
184.37	0.0060	329.98	0.0904	445.13	0.2151
189.95	0.0071	341.36	0.0993	449.74	0.2250
196.02	0.0084	353.49	0.1083	454.57	0.2341
200.57	0.0095	363.15	0.1170	457.95	0.2459
202.09	0.0108	374.52	0.1257	459.47	0.2573
207.19	0.0119	382.59	0.1344	461.88	0.2716
209.95	0.0131				

Table 226. Test data for specimen 682–24

Test Number	: 076	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 176.7 MPa	Ultimate Stress	: 475.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
144.63	0.0011	300.68	0.0386	425.46	0.1590
164.92	0.0019	305.23	0.0420	429.79	0.1651
171.17	0.0021	310.63	0.0467	441.10	0.1832
183.88	0.0027	318.15	0.0528	445.55	0.1926
212.61	0.0042	343.22	0.0750	447.79	0.1962
228.63	0.0049	353.13	0.0838	450.39	0.2017
237.41	0.0057	358.48	0.0887	452.39	0.2057
241.90	0.0066	364.49	0.0942	454.68	0.2100
245.26	0.0072	373.56	0.0998	458.35	0.2196
247.63	0.0082	379.16	0.1047	468.65	0.2491
250.89	0.0092	383.98	0.1103	470.46	0.2544
269.81	0.0176	386.76	0.1132	471.52	0.2588
272.29	0.0191	406.62	0.1355	472.54	0.2637
274.96	0.0208	409.80	0.1389	473.75	0.2683
278.12	0.0226	412.29	0.1418	475.31	0.2727
280.74	0.0243	414.92	0.1455	475.15	0.2776
284.99	0.0270	420.54	0.1523		

Table 227. Test data for specimen 68–120

Test Number	: 077	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 193.9 MPa	Ultimate Stress	: 484.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
159.5000	0.0019	328.6900	0.0532	441.4700	0.1506
170.9400	0.0024	335.1200	0.0583	444.3000	0.1544
184.2900	0.0030	340.7600	0.0628	446.9200	0.1575
196.4600	0.0037	347.3400	0.0678	449.5000	0.1611
211.0100	0.0044	351.5400	0.0707	454.1700	0.1679
244.7000	0.0069	356.3400	0.0743	456.3100	0.1711
249.3900	0.0079	377.4600	0.0898	461.4800	0.1796
253.9800	0.0094	383.3000	0.0947	464.0600	0.1838
260.6400	0.0116	389.3400	0.0972	465.8000	0.1872
264.7900	0.0132	395.5800	0.1024	469.8900	0.1956
268.4900	0.0149	400.4300	0.1063	477.4800	0.2170
272.1000	0.0166	403.7500	0.1096	478.8400	0.2212
276.5000	0.0187	407.4600	0.1127	480.1400	0.2260
279.4100	0.0202	410.4800	0.1153	481.0000	0.2300
287.7600	0.0249	413.3500	0.1179	482.7700	0.2389
296.3100	0.0302	415.9300	0.1204	483.3800	0.2432
303.0300	0.0350	422.1200	0.1258	484.0900	0.2479
323.0100	0.0488	427.5200	0.1313	484.2600	0.2515

Table 228. Test data for specimen 681–06

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 169.7 MPa	Ultimate Stress	: 486.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.27	0.0002	238.56	0.0108	400.72	0.1097
66.60	0.0002	242.83	0.0120	408.24	0.1165
89.70	0.0004	246.00	0.0131	414.37	0.1233
111.70	0.0006	263.93	0.0193	423.41	0.1301
132.17	0.0011	278.13	0.0265	430.09	0.1368
147.75	0.0017	292.61	0.0338	436.23	0.1436
162.10	0.0023	304.54	0.0409	449.19	0.1569
175.26	0.0031	317.71	0.0478	451.88	0.1635
188.09	0.0039	326.40	0.0549	458.64	0.1701
199.05	0.0047	337.71	0.0619	463.12	0.1768
208.70	0.0057	349.15	0.0690	467.88	0.1832
215.87	0.0066	357.29	0.0758	471.81	0.1898
222.49	0.0077	365.70	0.0827	475.05	0.1961
227.66	0.0086	384.31	0.0962	479.53	0.2024
233.18	0.0098	394.31	0.1030	482.36	0.2078

Table 229. Test data for specimen 682–09

Test Number	: MEA Test	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 191.6 MPa	Ultimate Stress	: 503.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.24	0.0002	230.91	0.0075	417.82	0.1099
38.68	0.0003	238.21	0.0083	428.58	0.1199
59.36	0.0005	242.76	0.0094	436.51	0.1302
80.88	0.0006	248.56	0.0104	446.57	0.1404
104.32	0.0008	253.04	0.0115	452.78	0.1508
122.24	0.0011	279.79	0.0203	459.81	0.1614
143.34	0.0015	302.27	0.0303	466.57	0.1721
156.99	0.0020	320.95	0.0403	472.64	0.1829
171.96	0.0025	336.74	0.0503	479.12	0.1939
185.06	0.0032	352.60	0.0603	481.32	0.2052
196.36	0.0039	369.77	0.0704	488.08	0.2167
206.70	0.0048	381.42	0.0802	490.84	0.2277
217.46	0.0056	393.97	0.0900	493.60	0.2409
224.91	0.0065	404.31	0.0998	498.28	0.2515

Table 230. Test data for specimen 733–40

Test Number	: 016	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 254.3 MPa	Ultimate Stress	: 557.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
63.5814	0.0003	262.4600	0.0084	462.4630	0.2270
84.9001	0.0005	268.5910	0.0105	476.4350	0.2399
106.8720	0.0009	275.6970	0.0138	480.1400	0.2456
124.6350	0.0013	281.1460	0.0173	484.6510	0.2495
152.2530	0.0018	287.8630	0.0215	492.9110	0.2665
166.9750	0.0023	295.3100	0.0271	501.5690	0.2853
185.7380	0.0028	308.0140	0.0382	506.0760	0.2975
202.8910	0.0032	325.7820	0.0544	515.0850	0.3156
209.3630	0.0033	342.4300	0.0703	520.9320	0.3343
221.3840	0.0035	360.2990	0.0893	529.8790	0.3558
229.2450	0.0036	380.5990	0.1106	537.4600	0.3760
240.0750	0.0043	398.3240	0.1313	543.7160	0.3972
248.1560	0.0050	417.7070	0.1569	550.2940	0.4162
253.6530	0.0059	436.4070	0.1842	554.0220	0.4328
257.4490	0.0069	452.0410	0.2093	556.9630	0.4463

Table 231. Test data for specimen 733–41

Test Number	: 017	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 249.5 MPa	Ultimate Stress	: 530.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
57.54	0.0003	315.80	0.0467	481.10	0.2757
103.56	0.0011	333.74	0.0648	489.91	0.2954
147.78	0.0021	351.77	0.0837	503.35	0.3317
194.54	0.0038	368.00	0.1007	509.95	0.3536
205.22	0.0039	383.59	0.1184	514.83	0.3748
229.48	0.0045	399.42	0.1376	520.18	0.3932
248.07	0.0055	402.92	0.1403	523.68	0.4139
255.24	0.0063	426.19	0.1725	527.32	0.4321
262.66	0.0075	447.50	0.2064	528.83	0.4459
267.73	0.0090	437.57	0.1907	530.67	0.4654
275.69	0.0125	461.90	0.2318	530.78	0.4808
287.00	0.0201	472.78	0.2550	530.79	0.5001
297.14	0.0284				

Table 232. Test data for specimen 734–23

Test Number	: 218	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 221.9 MPa	Ultimate Stress	: 475.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
35.201	0.0002	316.982	0.0882	415.842	0.2432
50.230	0.0004	318.460	0.0900	424.156	0.2605
109.948	0.0011	327.099	0.1011	436.441	0.2900
171.163	0.0019	344.669	0.1252	443.083	0.3083
231.938	0.0065	352.387	0.1363	450.399	0.3307
261.579	0.0293	357.424	0.1437	454.902	0.3459
263.135	0.0311	371.837	0.1662	457.632	0.3558
264.870	0.0328	377.470	0.1756	465.020	0.3876
291.185	0.0584	378.464	0.1775	467.415	0.3998
292.756	0.0600	401.099	0.2160	472.976	0.4350
300.484	0.0681	405.002	0.2226	475.332	0.4714

Table 233. Test data for specimen 734–24

Test Number	: 219	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 228.2 MPa	Ultimate Stress	: 521.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.163	0.0001	373.504	0.1373	473.833	0.3118
92.275	0.0006	374.976	0.1393	478.661	0.3253
164.513	0.0011	376.803	0.1413	494.476	0.3783
176.243	0.0012	410.308	0.1858	498.945	0.3933
226.308	0.0032	411.421	0.1879	503.802	0.4166
257.628	0.0160	418.736	0.1988	508.854	0.4450
260.197	0.0182	438.544	0.2322	512.788	0.4711
274.920	0.0315	445.014	0.2446	516.091	0.4978
320.321	0.0777	453.704	0.2621	518.131	0.5150
322.313	0.0799	462.894	0.2834	519.151	0.5309
324.377	0.0820	473.060	0.3095	521.240	0.5848

Table 234. Test data for specimen 732–25

Test Number	: 014	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 244.0 MPa	Ultimate Stress	: 526.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
36.15	0.0001	288.81	0.0229	483.08	0.2457
60.31	0.0003	302.72	0.0340	486.34	0.2590
84.51	0.0006	323.55	0.0524	490.23	0.2692
108.59	0.0011	342.47	0.0694	494.65	0.2836
132.31	0.0016	358.96	0.0860	500.81	0.3004
156.59	0.0021	375.53	0.1021	504.35	0.3079
180.62	0.0028	391.90	0.1188	507.79	0.3226
203.99	0.0034	407.09	0.1365	513.05	0.3378
221.44	0.0038	421.20	0.1537	515.33	0.3490
240.27	0.0047	432.99	0.1692	518.65	0.3610
243.07	0.0049	445.48	0.1872	519.90	0.3632
253.14	0.0063	457.09	0.2055	522.92	0.3819
260.80	0.0082	466.51	0.2220	524.52	0.4021
268.76	0.0111	476.07	0.2395	526.23	0.4151
275.87	0.0145	478.09	0.2429	526.46	0.4309

Table 235. Test data for specimen 732–26

Test Number	: 015	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 244.4 MPa	Ultimate Stress	: 528.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
33.1610	0.0001	286.5200	0.0188	470.6100	0.2373
58.0510	0.0003	292.8000	0.0228	479.3800	0.2556
82.5420	0.0006	300.7600	0.0282	481.5200	0.2604
106.4300	0.0011	307.1600	0.0331	486.1000	0.2614
129.9400	0.0016	324.4700	0.0480	487.8900	0.2723
154.9900	0.0022	341.3800	0.0640	494.8400	0.2897
178.0200	0.0028	358.3900	0.0813	501.2900	0.3075
206.4600	0.0037	374.8500	0.0982	508.0900	0.3266
209.3700	0.0037	389.7700	0.1143	514.6400	0.3459
223.7100	0.0041	403.2300	0.1309	518.8800	0.3648
237.0900	0.0045	414.9900	0.1455	519.5500	0.3694
244.5600	0.0052	425.4800	0.1603	522.3200	0.3719
251.4300	0.0060	435.6200	0.1751	525.2200	0.3906
257.1300	0.0070	445.9400	0.1919	526.4100	0.4006
261.7100	0.0082	455.4300	0.2085	527.8400	0.4115
267.7700	0.0100	462.6900	0.2210	528.4200	0.4296
275.7600	0.0135				

Table 236. Test data for specimen 734–06

Test Number	: 220	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 228.0 MPa	Ultimate Stress	: 536.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
18.238	0.0001	318.152	0.0474	451.977	0.1875
42.648	0.0004	346.750	0.0746	472.198	0.2156
53.881	0.0005	348.942	0.0768	480.488	0.2285
179.881	0.0022	376.168	0.1078	495.178	0.2547
190.256	0.0024	378.054	0.1101	503.226	0.2711
199.656	0.0028	380.449	0.1123	514.473	0.2981
250.900	0.0076	410.366	0.1407	515.879	0.3023
257.241	0.0091	412.257	0.1427	524.799	0.3300
280.837	0.0188	422.414	0.1531	526.932	0.3386
303.807	0.0353	448.831	0.1834	533.283	0.3696
306.289	0.0373	450.275	0.1854	536.822	0.4116

Table 237. Test data for specimen 734–07

Test Number	: 221	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 219.1 MPa	Ultimate Stress	: 529.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
39.655	0.0002	332.413	0.0708	490.091	0.3044
55.337	0.0003	373.667	0.1109	502.862	0.3496
67.588	0.0004	383.268	0.1215	503.489	0.3519
123.036	0.0007	416.276	0.1618	513.658	0.4004
133.957	0.0007	419.481	0.1660	514.574	0.4050
146.791	0.0008	443.578	0.2024	518.959	0.4332
210.418	0.0024	452.379	0.2175	521.610	0.4522
217.917	0.0031	465.184	0.2424	526.237	0.4960
256.709	0.0134	470.317	0.2534	527.056	0.5068
274.839	0.0246	473.247	0.2600	527.249	0.5092
317.530	0.0577	486.091	0.2932	533.659	0.4116

Table 238. Test data for specimen 73–119

Test Number	: 222	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 212.8 MPa	Ultimate Stress	: 488.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
81.198	0.0005	317.202	0.0694	428.975	0.1950
160.878	0.0012	319.709	0.0717	430.599	0.1973
198.210	0.0023	337.189	0.0889	443.887	0.2178
206.442	0.0029	347.960	0.0999	459.285	0.2402
245.229	0.0116	350.139	0.1022	465.825	0.2586
249.388	0.0138	369.571	0.1225	472.187	0.2741
253.026	0.0160	379.942	0.1339	483.440	0.3045
277.109	0.0338	382.053	0.1363	485.320	0.3168
279.943	0.0361	397.620	0.1544	488.115	0.3497

Table 239. Test data for specimen 732–16

Test Number	: 012	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 240.8 MPa	Ultimate Stress	: 541.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
30.76	0.0000	333.00	0.0585	491.68	0.2327
51.55	0.0002	340.74	0.0655	494.49	0.2408
82.38	0.0006	349.35	0.0726	500.65	0.2515
119.05	0.0013	363.37	0.0864	509.64	0.2700
151.04	0.0020	376.95	0.0984	517.34	0.2907
176.61	0.0027	386.90	0.1080	521.02	0.2948
193.73	0.0033	399.61	0.1203	524.73	0.3088
211.94	0.0036	413.26	0.1342	528.09	0.3203
240.09	0.0049	424.21	0.1462	532.52	0.3385
257.88	0.0071	433.32	0.1567	533.30	0.3501
269.13	0.0098	445.81	0.1677	536.02	0.3669
277.83	0.0138	459.01	0.1844	537.79	0.3805
285.55	0.0181	474.02	0.2054	540.14	0.3980
291.91	0.0223	481.76	0.2167	540.42	0.4137
302.71	0.0311	485.41	0.2212	540.81	0.4314
314.19	0.0413	489.04	0.2305	541.81	0.4492

Table 240. Test data for specimen 732–17

Test Number	: 013	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 252.6 MPa	Ultimate Stress	: 555.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.02	0.0000	315.60	0.0374	506.90	0.2655
42.34	0.0001	333.72	0.0542	522.51	0.2973
87.99	0.0008	349.17	0.0684	530.96	0.3220
125.42	0.0016	366.36	0.0851	534.58	0.3360
159.13	0.0025	383.00	0.0995	538.98	0.3462
181.55	0.0031	397.17	0.1132	540.32	0.3555
208.85	0.0041	410.44	0.1262	543.40	0.3729
238.65	0.0050	426.68	0.1429	546.91	0.3854
251.97	0.0059	437.78	0.1552	548.39	0.3946
256.64	0.0065	450.76	0.1706	549.97	0.4048
264.81	0.0080	458.38	0.1802	551.73	0.4110
270.67	0.0094	466.46	0.1907	552.43	0.4234
281.79	0.0113	465.84	0.1959	554.68	0.4394
292.09	0.0171	476.96	0.2130	554.91	0.4499
303.46	0.0264	491.28	0.2365	555.72	0.4638

Table 241. Test data for specimen 732–15

Test Number	: 226	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 235.3 MPa	Ultimate Stress	: 563.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
29.582	0.0001	379.611	0.0953	515.150	0.2914
56.208	0.0003	395.718	0.1109	525.892	0.3231
79.423	0.0004	397.992	0.1131	530.537	0.3389
161.338	0.0009	428.919	0.1465	531.311	0.3411
172.776	0.0010	445.501	0.1663	538.423	0.3695
236.484	0.0034	447.199	0.1684	542.004	0.3849
275.366	0.0136	482.960	0.2218	548.632	0.4181
301.010	0.0291	493.861	0.2420	551.826	0.4360
337.284	0.0572	495.071	0.2443	556.858	0.4692
340.018	0.0596	509.925	0.2780	558.600	0.4821
360.175	0.0774	514.328	0.2891	563.196	0.5341

Table 242. Test data for specimen 732–22

Test Number	: 227	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 215.8 MPa	Ultimate Stress	: 530.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
53.560	0.0005	325.970	0.0621	455.794	0.2132
77.759	0.0006	336.761	0.0723	478.769	0.2544
155.999	0.0012	355.620	0.0910	485.473	0.2687
176.921	0.0015	357.644	0.0930	496.895	0.2963
205.216	0.0026	359.630	0.0950	500.654	0.3067
221.357	0.0041	383.033	0.1196	504.896	0.3192
251.508	0.0088	395.834	0.1338	515.499	0.3572
297.723	0.0366	416.534	0.1584	518.969	0.3723
300.224	0.0388	424.443	0.1684	524.848	0.4059
302.653	0.0409	435.186	0.1829	530.343	0.4710

Table 243. Test data for specimen 73–109

Test Number	: 228	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 222.2 MPa	Ultimate Stress	: 534.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
32.850	0.0001	336.327	0.0891	468.932	0.2571
59.574	0.0003	337.961	0.0911	482.822	0.2865
104.921	0.0006	350.675	0.1055	489.521	0.3036
127.785	0.0008	377.216	0.1322	500.221	0.3337
191.731	0.0016	390.451	0.1468	502.823	0.3424
199.177	0.0019	392.393	0.1489	510.534	0.3706
205.563	0.0020	429.614	0.1941	512.655	0.3793
241.531	0.0071	431.108	0.1962	513.667	0.3837
275.601	0.0261	432.646	0.1982	526.150	0.4512
293.674	0.0435	459.852	0.2403	530.439	0.4881
306.523	0.0566	461.086	0.2424	534.006	0.5508

Table 244. Test data for specimen 731–04

Test Number	: 010	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 256.5 MPa	Ultimate Stress	: 493.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
8.29	0.0001	272.92	0.0172	435.18	0.1900
22.58	0.0007	283.53	0.0235	445.30	0.2054
35.00	0.0011	289.53	0.0277	450.97	0.2155
53.14	0.0016	296.27	0.0325	458.77	0.2295
82.16	0.0024	299.32	0.0357	465.85	0.2439
95.14	0.0028	311.78	0.0465	473.01	0.2584
119.59	0.0035	320.91	0.0554	475.11	0.2631
159.98	0.0048	334.02	0.0679	477.20	0.2672
174.77	0.0054	347.89	0.0828	478.09	0.2679
187.55	0.0060	361.71	0.0964	478.90	0.2758
203.69	0.0064	375.19	0.1112	482.31	0.2831
240.20	0.0077	387.00	0.1248	483.18	0.2866
251.80	0.0113	398.53	0.1388	488.03	0.2992
260.52	0.0134	406.89	0.1494	492.21	0.3149
266.20	0.0148	416.00	0.1617	493.08	0.3271
271.89	0.0167	425.66	0.1752		

Table 245. Test data for specimen 731–05

Test Number	: 011	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 234.0 MPa	Ultimate Stress	: 570.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
39.16	0.0001	319.71	0.0487	512.44	0.3145
74.25	0.0005	335.35	0.0634	523.58	0.3431
107.29	0.0011	345.23	0.0725	530.14	0.3669
151.01	0.0022	362.62	0.0908	536.91	0.3889
187.59	0.0034	379.33	0.1076	542.07	0.4098
201.62	0.0039	393.56	0.1227	547.56	0.4384
213.94	0.0042	406.91	0.1385	553.22	0.4654
233.52	0.0048	418.10	0.1514	555.89	0.4896
244.49	0.0060	428.97	0.1654	561.52	0.5219
253.92	0.0074	439.08	0.1790	564.74	0.5496
262.56	0.0091	447.35	0.1907	567.28	0.5770
270.46	0.0116	457.55	0.2041	569.40	0.6049
278.53	0.0153	464.72	0.2167	568.50	0.6194
283.34	0.0181	479.35	0.2410	569.29	0.6316
294.38	0.0260	490.43	0.2626	570.00	0.6451
309.61	0.0396	503.95	0.2905	570.41	0.6604

Table 246. Test data for specimen 733–42

Test Number	: 053	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 138.9 MPa	Ultimate Stress	: 366.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
36.89	0.0001	212.64	0.0724	363.51	0.3141
81.24	0.0006	224.78	0.0881	366.21	0.3275
109.37	0.0012	234.48	0.0987	365.23	0.3426
119.43	0.0015	244.10	0.1098	361.24	0.3507
126.92	0.0019	256.89	0.1250	356.19	0.3575
130.73	0.0021	269.42	0.1402	348.37	0.3646
136.31	0.0025	282.96	0.1576	339.58	0.3712
140.16	0.0029	295.72	0.1751	328.57	0.3781
145.85	0.0037	307.50	0.1927	311.87	0.3865
151.22	0.0054	317.37	0.2092	297.48	0.3923
162.25	0.0128	328.94	0.2295	281.67	0.3979
174.94	0.0265	338.01	0.2474	269.39	0.4014
191.15	0.0478	345.53	0.2629	253.78	0.4040
201.33	0.0605	356.49	0.2925	234.47	0.4047

Table 247. Test data for specimen 734–40

Test Number	: 038	Test Temp.	: 290℃
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 133.9 MPa	Ultimate Stress	: 365.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
29.51	0.0001	143.94	0.0052	263.42	0.1246
45.17	0.0003	146.52	0.0059	276.04	0.1384
55.34	0.0004	147.73	0.0063	287.41	0.1516
66.93	0.0006	149.18	0.0069	300.80	0.1673
80.09	0.0008	151.89	0.0082	309.67	0.1788
91.18	0.0011	156.16	0.0109	317.74	0.1894
102.23	0.0014	163.03	0.0162	321.70	0.1945
109.98	0.0017	169.47	0.0225	328.21	0.2046
116.46	0.0019	175.20	0.0282	333.18	0.2119
120.34	0.0021	183.59	0.0377	340.54	0.2247
123.08	0.0023	193.33	0.0489	349.87	0.2417
127.10	0.0026	200.62	0.0567	357.93	0.2578
130.18	0.0029	206.60	0.0636	361.61	0.2689
133.99	0.0033	214.43	0.0721	362.49	0.2742
137.27	0.0037	226.27	0.0856	364.09	0.2765
139.41	0.0041	241.51	0.1016	364.97	0.2775
141.80	0.0046	251.03	0.1112		

Table 248. Test data for specimen 734–19

Test Number	: 338	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 130.4 MPa	Ultimate Stress	: 354.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.3600	0.0001	183.1900	0.0425	299.4700	0.1677
69.6300	0.0003	185.4900	0.0447	302.7600	0.1720
104.8700	0.0007	194.5700	0.0535	307.6400	0.1787
110.7800	0.0010	199.0200	0.0580	310.7900	0.1831
127.6700	0.0022	205.7200	0.0646	318.4200	0.1942
132.8700	0.0032	207.9000	0.0668	321.8800	0.2013
138.5800	0.0051	214.4600	0.0733	327.5000	0.2104
142.7900	0.0071	225.2300	0.0842	332.8600	0.2210
155.3400	0.0164	235.9500	0.0952	339.4200	0.2327
157.4800	0.0184	240.1900	0.0996	342.1600	0.2417
164.7700	0.0248	248.4200	0.1082	343.9100	0.2441
167.1800	0.0272	258.5700	0.1192	346.2900	0.2511
169.5200	0.0294	268.5200	0.1302	350.5000	0.2631
171.5200	0.0314	278.0600	0.1412	352.3400	0.2722
173.8500	0.0337	285.5100	0.1500	353.9600	0.2833
180.8700	0.0403	292.5200	0.1588		

Table 249. Test data for specimen 734–22

Test Number	: 339	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 131.3 MPa	Ultimate Stress	: 365.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
25.2600	0.0001	186.8700	0.0573	294.7900	0.2073
74.7300	0.0002	188.6900	0.0595	298.8700	0.2118
116.3100	0.0008	190.5500	0.0617	304.4800	0.2211
122.9900	0.0012	197.7900	0.0707	311.3200	0.2363
138.9000	0.0053	201.4500	0.0750	317.7300	0.2477
142.2500	0.0075	208.6400	0.0840	321.0300	0.2518
145.0700	0.0096	212.1700	0.0884	323.9500	0.2606
154.4700	0.0190	219.2000	0.0971	329.1500	0.2736
156.1900	0.0210	222.6800	0.1016	334.0800	0.2822
158.3200	0.0233	227.6500	0.1080	338.1800	0.2961
160.2700	0.0257	229.3300	0.1100	342.3000	0.3068
162.3500	0.0280	239.5200	0.1233	346.3900	0.3221
164.2800	0.0304	255.9800	0.1453	349.3300	0.3283
171.9400	0.0394	265.4000	0.1586	356.7800	0.3503
173.8900	0.0418	275.3500	0.1723	360.9500	0.3657
175.7700	0.0440	284.1800	0.1855	360.1700	0.3720
177.5900	0.0462	289.4300	0.1940	365.2000	0.3851

Table 250. Test data for specimen 732-27

Test Number	: 043	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 2570 h
Yield Stress	: 139.6 MPa	Ultimate Stress	: 419.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
54.670	0.004	150.050	0.014	276.170	0.152
62.100	0.004	155.060	0.016	344.910	0.255
102.100	0.007	161.050	0.018	356.690	0.276
113.460	0.008	165.610	0.021	392.930	0.360
122.810	0.009	171.140	0.025	407.250	0.407
128.860	0.010	197.890	0.053	416.120	0.446
140.410	0.012	205.220	0.062	418.900	0.460
145.130	0.013	260.650	0.131	419.840	0.505

Table 251. Test data for specimen 734-08

Test Number	: 333	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 127.7 MPa	Ultimate Stress	: 377.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.990	0.000	201.880	0.054	300.510	0.159
53.340	0.000	220.140	0.072	307.360	0.168
81.630	0.001	222.370	0.074	320.220	0.186
109.700	0.001	231.220	0.083	326.300	0.195
122.980	0.002	248.340	0.100	340.890	0.220
139.960	0.006	250.480	0.102	342.320	0.222
162.010	0.019	256.640	0.109	355.150	0.248
169.910	0.025	272.720	0.126	356.480	0.251
172.570	0.028	274.650	0.128	366.090	0.278
192.480	0.045	280.390	0.135	374.820	0.304
194.840	0.048	293.380	0.150	377.640	0.329

Table 252. Test data for specimen 734–09

Test Number	: 334	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 139.6 MPa	Ultimate Stress	: 419.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
69.570	0.000	227.650	0.035	326.370	0.107
91.750	0.000	230.960	0.037	331.810	0.111
123.330	0.000	249.940	0.051	352.110	0.128
131.620	0.000	253.160	0.053	356.880	0.132
143.360	0.001	262.310	0.059	372.750	0.148
150.760	0.001	274.630	0.068	379.020	0.154
156.890	0.001	277.660	0.070	390.760	0.167
188.280	0.010	280.660	0.072	392.550	0.170
192.590	0.013	298.340	0.085	406.350	0.190
196.580	0.015	301.230	0.087	414.750	0.206
217.920	0.029	309.760	0.094	417.400	0.221

Table 253. Test data for specimen 73-120

Test Number	: 335	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 136.7 MPa	Ultimate Stress	: 386.4 MPa

Experimental Data Not Available.

Table 254. Test data for specimen 732–18

Test Number	: 040	Test Temp.	: 290°C
Material Type	: CF–8M	Heat Number	: 73
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 140.0 MPa	Ultimate Stress	: 444.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
32.15	0.0001	189.17	0.0034	365.51	0.1686
47.62	0.0001	189.26	0.0037	378.04	0.1841
64.14	0.0003	189.77	0.0042	390.04	0.2007
85.81	0.0005	203.66	0.0128	400.67	0.2173
109.85	0.0008	216.66	0.0234	411.57	0.2361
137.33	0.0013	233.49	0.0387	420.82	0.2548
160.82	0.0018	254.17	0.0579	428.34	0.2732
176.05	0.0022	270.95	0.0727	433.46	0.2884
189.27	0.0026	288.48	0.0899	435.29	0.2929
189.36	0.0028	308.44	0.1079	436.81	0.2991
189.25	0.0029	322.78	0.1219	439.73	0.3110
189.19	0.0031	337.39	0.1368	441.12	0.3270
189.23	0.0032	352.49	0.1533		

Table 255. Test data for specimen 732-23

Test Number	: 238	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 138.5 MPa	Ultimate Stress	: 408.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
39.952	0.0002	224.072	0.0589	319.338	0.1596
41.205	0.0002	225.843	0.0609	324.781	0.1661
76.550	0.0003	241.520	0.0761	337.125	0.1817
105.553	0.0006	248.507	0.0830	345.640	0.1930
133.524	0.0020	250.679	0.0851	365.740	0.2249
138.580	0.0027	265.926	0.1006	371.130	0.2342
161.457	0.0080	276.716	0.1120	387.910	0.2681
184.842	0.0236	278.772	0.1142	388.747	0.2702
195.375	0.0325	294.879	0.1318	399.140	0.2986
197.891	0.0349	304.673	0.1424	403.988	0.3157
214.836	0.0502	317.504	0.1575	408.483	0.3442

Table 256. Test data for specimen 732-24

Test Number	: 237	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 143.0 MPa	Ultimate Stress	: 424.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.738	0.0001	220.316	0.0438	335.441	0.1485
19.668	0.0001	245.902	0.0653	337.508	0.1506
32.646	0.0001	248.408	0.0673	359.185	0.1740
76.517	0.0002	255.811	0.0737	362.906	0.1783
85.673	0.0002	279.768	0.0951	379.586	0.1998
95.129	0.0003	282.158	0.0972	382.738	0.2043
163.380	0.0064	284.418	0.0993	394.791	0.2226
168.990	0.0085	305.165	0.1185	402.656	0.2361
185.270	0.0175	307.421	0.1207	414.950	0.2609
206.716	0.0330	309.681	0.1226	419.258	0.2723
217.661	0.0417	324.872	0.1377	424.116	0.2952

Table 257. Test data for specimen 73-110

Test Number	: 239	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 138.5 MPa	Ultimate Stress	: 395.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.550	0.0002	238.341	0.0716	331.449	0.1747
59.248	0.0002	256.103	0.0890	332.988	0.1769
71.576	0.0002	268.974	0.1021	349.763	0.2022
153.928	0.0059	271.016	0.1045	351.137	0.2047
159.463	0.0078	289.712	0.1244	364.327	0.2276
164.147	0.0101	291.676	0.1265	365.565	0.2299
202.531	0.0389	293.907	0.1290	371.159	0.2410
205.178	0.0412	314.548	0.1532	378.871	0.2583
207.679	0.0435	316.387	0.1554	388.790	0.2863
226.980	0.0609	318.104	0.1577	390.460	0.2910
236.091	0.0696	329.683	0.1726	395.782	0.3195

Table 258. Test data for specimen 731–06

Test Number	: 046	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 144.1 MPa	Ultimate Stress	: 411.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
29.02	0.0001	186.38	0.0130	332.89	0.1288
65.85	0.0004	190.12	0.0151	350.86	0.1449
105.44	0.0010	195.94	0.0187	361.90	0.1562
119.94	0.0013	200.74	0.0219	372.27	0.1668
132.67	0.0018	205.77	0.0259	384.53	0.1808
141.35	0.0024	215.21	0.0333	390.69	0.1887
149.35	0.0031	226.34	0.0425	394.06	0.1937
157.58	0.0041	239.92	0.0534	396.56	0.1981
162.67	0.0050	254.04	0.0643	400.20	0.2041
167.37	0.0061	268.83	0.0754	405.92	0.2139
171.76	0.0073	280.80	0.0860	409.11	0.2204
174.93	0.0083	292.82	0.0954	410.07	0.2234
177.95	0.0094	305.56	0.1056	411.19	0.2260
181.65	0.0109	319.21	0.1168		

Table 259. Test data for specimen 732–09

Test Number	: 041	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 136.2 MPa	Ultimate Stress	: 436.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
37.5850	0.0001	171.4200	0.0100	381.2500	0.2277
69.3680	0.0003	176.4600	0.0126	391.7700	0.2460
102.0400	0.0008	186.5000	0.0189	396.7800	0.2542
114.3600	0.0011	197.4700	0.0279	405.0100	0.2717
124.7100	0.0014	211.5200	0.0413	410.7000	0.2872
129.8600	0.0017	229.1000	0.0578	417.4200	0.3029
134.2700	0.0020	246.5600	0.0739	423.5200	0.3173
137.9400	0.0023	267.6000	0.0945	427.7300	0.3357
141.2700	0.0027	288.8900	0.1150	429.2200	0.3470
145.0300	0.0032	309.2100	0.1353	431.7900	0.3501
147.6700	0.0035	330.8000	0.1595	433.2200	0.3636
150.5000	0.0039	344.6900	0.1765	432.2100	0.3687
154.3100	0.0046	357.7500	0.1931	435.9300	0.3796
160.1600	0.0059	369.5400	0.2100	436.0800	0.3807
166.7300	0.0079				

Table 260. Test data for specimen 205–26

Test Number	: 097	Test Temp.	: 25°C
Material Type	: CF–8M	Heat Number	: 205
Aging Temp.	: 400°C	Aging Time	: 18,000 h
Yield Stress	: 248.5 MPa	Ultimate Stress	: 670.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
191.30	0.0016	431.56	0.0324	600.09	0.1400
216.73	0.0018	445.23	0.0383	607.97	0.1484
234.10	0.0020	458.65	0.0452	621.82	0.1670
254.13	0.0026	474.03	0.0537	624.86	0.1723
276.36	0.0037	482.16	0.0583	628.61	0.1762
297.46	0.0048	501.75	0.0695	630.48	0.1811
308.01	0.0055	513.98	0.0769	636.90	0.1895
321.36	0.0066	528.91	0.0863	640.61	0.1953
332.49	0.0079	535.40	0.0904	642.88	0.1995
344.52	0.0094	546.34	0.0979	643.48	0.2041
356.19	0.0111	556.40	0.1026	645.47	0.2076
365.26	0.0126	564.22	0.1085	647.37	0.2111
374.73	0.0144	568.76	0.1122	648.22	0.2179
382.19	0.0161	573.68	0.1160	651.78	0.2214
389.35	0.0179	578.41	0.1201	659.84	0.2267
397.58	0.0202	586.31	0.1274	659.19	0.2298
410.97	0.0244	590.64	0.1318	660.80	0.2337
424.59	0.0293	596.05	0.1360	663.88	0.2517

Table 261. Test data for specimen 205–27

Test Number	: 189	Test Temp.	: 25°C
Material Type	: CF–8M	Heat Number	: 205
Aging Temp.	: 400°C	Aging Time	: 18,000 h
Yield Stress	: 254.0 MPa	Ultimate Stress	: 642.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
17.540	0.0001	368.255	0.0196	572.446	0.1578
30.976	0.0002	410.249	0.0349	590.300	0.1827
41.902	0.0002	427.740	0.0433	592.913	0.1868
53.175	0.0003	457.991	0.0600	607.912	0.2140
122.255	0.0006	461.189	0.0621	614.783	0.2288
134.240	0.0007	489.417	0.0807	620.492	0.2434
193.178	0.0011	492.320	0.0827	625.766	0.2584
269.980	0.0044	513.803	0.0992	628.863	0.2691
278.196	0.0051	542.786	0.1251	635.540	0.2974
285.976	0.0058	544.818	0.1271	637.911	0.3108
362.193	0.0180	570.946	0.1557	642.363	0.3658

Table 262. Test data for specimen 205–30

Test Number	: 098	Test Temp.	: 25°C
Material Type	: CF–8M	Heat Number	: 205
Aging Temp.	: 400°C	Aging Time	: 18,000 h
Yield Stress	: 248.7 MPa	Ultimate Stress	: 646.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
206.46	0.0017	300.74	0.0206	589.99	0.1599
232.03	0.0019	425.81	0.0304	596.92	0.1690
241.03	0.0022	439.16	0.0364	600.23	0.1746
265.57	0.0029	454.41	0.0444	608.70	0.1898
273.64	0.0034	467.23	0.0515	610.94	0.1934
294.30	0.0046	473.59	0.0623	616.00	0.2039
305.86	0.0052	485.56	0.0715	618.42	0.2101
316.30	0.0061	514.52	0.0911	623.86	0.2235
326.24	0.0070	533.89	0.1031	627.25	0.2341
335.74	0.0082	539.57	0.1075	630.15	0.2444
344.85	0.0094	552.28	0.1185	632.95	0.2549
351.41	0.0104	557.75	0.1240	633.81	0.2596
360.08	0.0118	562.05	0.1280	634.96	0.2659
368.89	0.0132	567.33	0.1334	636.11	0.2725
376.70	0.0154	572.12	0.1384	637.06	0.2802
384.83	0.0172	575.73	0.1421	638.20	0.2865
390.75	0.0186	582.66	0.1506	639.67	0.3103

Table 263. Test data for specimen 205–25

Test Number	: 061	Test Temp.	: 290°C
Material Type	: CF–8M	Heat Number	: 205
Aging Temp.	: 400°C	Aging Time	: 18,000 h
Yield Stress	: 179.4 MPa	Ultimate Stress	: 505.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
73.83	0.0002	263.54	0.0096	427.35	0.0939
105.52	0.0006	274.92	0.0124	446.96	0.1061
127.98	0.0009	285.57	0.0155	462.80	0.1199
141.76	0.0012	294.26	0.0185	473.64	0.1309
156.10	0.0016	301.80	0.0212	482.97	0.1419
167.01	0.0020	317.07	0.0277	483.46	0.1437
176.70	0.0024	343.30	0.0410	485.46	0.1484
191.30	0.0033	363.02	0.0523	494.14	0.1610
202.85	0.0039	379.90	0.0624	500.51	0.1719
226.10	0.0048	395.39	0.0723	504.16	0.1812
240.81	0.0057	414.01	0.0844	505.94	0.1900
251.80	0.0072	432.47	0.0972		

Table 264. Test data for specimen 205–28

Test Number	: 062	Test Temp.	: 290°C
Material Type	: CF–8M	Heat Number	: 205
Aging Temp.	: 400°C	Aging Time	: 18,000 h
Yield Stress	: 177.3 MPa	Ultimate Stress	: 507.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
58.95	0.0001	249.60	0.0078	437.50	0.1023
97.97	0.0005	272.90	0.0135	445.27	0.1084
127.29	0.0009	282.70	0.0168	456.48	0.1183
150.45	0.0014	296.26	0.0216	464.98	0.1266
161.64	0.0018	302.94	0.0243	473.76	0.1359
175.49	0.0024	313.87	0.0292	480.32	0.1442
183.44	0.0029	324.21	0.0344	488.44	0.1558
191.23	0.0035	334.40	0.0395	488.76	0.1597
198.38	0.0041	345.57	0.0459	492.46	0.1664
204.58	0.0044	357.23	0.0525	495.10	0.1720
207.90	0.0045	376.94	0.0642	499.73	0.1812
212.41	0.0048	388.54	0.0713	503.65	0.1911
217.47	0.0050	402.99	0.0806	506.79	0.2007
224.91	0.0052	414.19	0.0880	507.79	0.2125
231.66	0.0055	426.47	0.0961		

Table 265. Test data for specimen 205–29

Test Number	: 063	Test Temp.	: 290°C
Material Type	: CF–8M	Heat Number	: 205
Aging Temp.	: 400°C	Aging Time	: 18,000 h
Yield Stress	: 168.2 MPa	Ultimate Stress	: 495.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.298	0.000	273.080	0.013	405.300	0.082
52.043	0.000	277.910	0.015	431.860	0.098
84.180	0.000	292.950	0.020	438.340	0.103
114.680	0.001	299.220	0.022	458.180	0.121
142.790	0.001	317.940	0.031	463.760	0.128
159.560	0.002	322.480	0.033	477.880	0.145
171.100	0.002	343.290	0.044	480.320	0.149
208.420	0.004	349.020	0.047	482.720	0.153
222.010	0.005	369.930	0.059	489.350	0.169
244.360	0.007	376.410	0.063	493.280	0.182
255.660	0.009	398.280	0.077	495.090	0.207

Table 266. Test data for specimen 743–40

Test Number	: 018	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 273.5 MPa	Ultimate Stress	: 542.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
64.02	0.0001	242.65	0.0024	305.32	0.0073
79.92	0.0002	251.00	0.0026	307.13	0.0079
102.27	0.0004	262.07	0.0030	311.09	0.0090
134.03	0.0007	271.34	0.0035	319.74	0.0129
163.90	0.0013	279.30	0.0040	329.32	0.0187
201.03	0.0019	289.45	0.0049	333.38	0.0216
222.64	0.0020	293.02	0.0053	336.51	0.0241
233.57	0.0021	300.97	0.0064	337.73	0.0248

Table 267. Test data for specimen 743–41

Test Number	: 019	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 273.0 MPa	Ultimate Stress	: 531.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
61.35	0.0001	332.46	0.0220	492.73	0.2468
99.28	0.0004	351.27	0.0381	500.24	0.2679
147.04	0.0009	366.49	0.0532	505.80	0.2888
194.95	0.0017	383.14	0.0703	511.08	0.3097
216.27	0.0020	396.74	0.0853	516.24	0.3324
230.83	0.0021	411.77	0.0990	520.44	0.3547
248.01	0.0026	426.53	0.1172	523.26	0.3782
267.12	0.0036	437.88	0.1324	525.92	0.3995
275.88	0.0041	451.84	0.1530	528.28	0.4215
286.63	0.0051	461.57	0.1698	529.56	0.4442
293.24	0.0060	471.00	0.1881	529.97	0.4676
299.88	0.0074	478.94	0.2046	530.62	0.4873
305.46	0.0087	478.90	0.2059	531.29	0.5134
313.12	0.0111	480.54	0.2136		
323.90	0.0167	485.31	0.2275		

Table 268. Test data for specimen 743–36

Test Number	: 209	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 282.2 MPa	Ultimate Stress	: 555.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.597	0.0001	355.981	0.0222	497.284	0.1267
60.766	0.0005	369.842	0.0290	502.649	0.1330
71.086	0.0006	401.412	0.0474	517.135	0.1519
150.844	0.0012	405.065	0.0497	521.329	0.1579
162.520	0.0013	415.478	0.0566	531.181	0.1744
219.047	0.0019	441.064	0.0751	534.400	0.1804
246.267	0.0025	443.932	0.0774	535.376	0.1825
278.189	0.0039	452.506	0.0844	542.887	0.1990
299.878	0.0059	473.669	0.1029	546.057	0.2074
305.062	0.0066	476.161	0.1052	553.665	0.2382
351.221	0.0199	491.090	0.1201	555.519	0.2562

Table 269. Test data for specimen 744–34

Test Number	: 210	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 292.9 MPa	Ultimate Stress	: 601.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
31.273	0.0002	371.929	0.0256	537.570	0.1376
63.195	0.0005	406.314	0.0433	557.323	0.1615
73.871	0.0005	418.093	0.0500	561.810	0.1681
171.674	0.0012	421.946	0.0522	572.540	0.1859
209.941	0.0015	452.155	0.0706	577.223	0.1950
221.739	0.0016	465.602	0.0795	588.099	0.2203
288.211	0.0037	496.211	0.1012	590.684	0.2279
305.594	0.0051	504.454	0.1077	596.293	0.2465
311.705	0.0058	507.234	0.1098	599.219	0.2609
357.263	0.0188	528.987	0.1290	601.267	0.2845

Table 270. Test data for specimen 74–135

Test Number	: 211	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 259.0 MPa	Ultimate Stress	: 570.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.921	0.0000	370.692	0.0406	515.735	0.1776
27.968	0.0001	373.988	0.0428	521.325	0.1878
49.482	0.0002	414.154	0.0705	535.977	0.2189
59.892	0.0003	424.868	0.0788	540.700	0.2313
185.372	0.0012	427.547	0.0808	548.315	0.2547
196.019	0.0014	460.084	0.1089	550.821	0.2634
240.021	0.0025	462.277	0.1109	554.146	0.2764
284.784	0.0058	472.191	0.1208	561.279	0.3117
290.833	0.0066	495.011	0.1470	563.110	0.3231
319.094	0.0136	496.505	0.1490	567.207	0.3552
352.060	0.0295	497.999	0.1511	570.243	0.4211

Table 271. Test data for specimen 744–21

Test Number	: 186	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 273.1 MPa	Ultimate Stress	: 551.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
27.489	0.0002	286.173	0.0058	364.179	0.0283
37.730	0.0003	293.457	0.0065	367.404	0.0303
47.986	0.0003	300.299	0.0073	373.795	0.0343
122.563	0.0009	306.491	0.0080	376.932	0.0364
237.999	0.0027	324.277	0.0106	382.669	0.0403
243.982	0.0030	335.371	0.0141	385.515	0.0423
249.457	0.0033	340.342	0.0160	390.936	0.0463
254.859	0.0035	345.598	0.0184	393.729	0.0483
260.129	0.0039	353.516	0.0223	398.627	0.0523
265.337	0.0042	357.381	0.0243	401.342	0.0543
270.191	0.0045	360.906	0.0263	406.283	0.0583

Table 272. Test data for specimen 744–25

Test Number	: 188	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 270.5 MPa	Ultimate Stress	: 565.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.191	0.0001	427.065	0.0904	508.494	0.2718
29.109	0.0002	432.025	0.0968	519.386	0.3129
40.396	0.0002	450.401	0.1246	519.916	0.3151
147.623	0.0008	454.965	0.1332	520.301	0.3174
160.206	0.0009	469.091	0.1610	536.446	0.3909
206.921	0.0013	470.001	0.1631	537.121	0.3931
216.853	0.0015	484.397	0.1973	544.109	0.4321
284.604	0.0045	485.264	0.1995	545.700	0.4408
368.997	0.0329	496.156	0.2309	546.181	0.4429
377.315	0.0393	505.506	0.2610	553.266	0.4910
379.985	0.0414	506.084	0.2632	561.941	0.5884

Table 273. Test data for specimen 742–42

Test Number	: 166	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 312.7 MPa	Ultimate Stress	: 589.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	370.90	0.0137	488.09	0.0889
253.26	0.0028	387.53	0.0193	510.31	0.1124
305.40	0.0048	401.24	0.0261	544.67	0.1599
323.58	0.0059	418.04	0.0357	564.75	0.2042
340.03	0.0075	437.59	0.0489	589.10	0.3110
353.80	0.0096	467.62	0.0714	589.93	0.3449

Table 274. Test data for specimen 744–39

Test Number	: 163	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 326.4 MPa	Ultimate Stress	: 663.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	407.90	0.0153	560.82	0.0989
299.42	0.0040	423.94	0.0196	602.75	0.1356
341.87	0.0062	437.85	0.0246	640.72	0.1874
363.93	0.0082	455.83	0.0321	666.18	0.2490
380.44	0.0101	495.61	0.0539	674.39	0.2943
393.51	0.0123				

Table 275. Test data for specimen 74–245

Test Number	: 159	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 278.8 MPa	Ultimate Stress	: 617.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.000	0.0000	376.120	0.0179	514.960	0.1082
234.550	0.0022	389.090	0.0231	539.480	0.1312
290.390	0.0044	408.500	0.0333	559.900	0.1572
309.100	0.0055	430.310	0.0458	578.040	0.1860
330.350	0.0075	452.460	0.0606	602.140	0.2383
343.310	0.0094	469.450	0.0731	615.080	0.2834
355.420	0.0117	488.080	0.0873	613.660	0.2839
365.500	0.0144	489.760	0.0890	616.980	0.3221

Table 276. Test data for specimen 741–28

Test Number	: 293	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 309.1 MPa	Ultimate Stress	: 668.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
12.454	0.0001	443.067	0.0303	609.894	0.1800
16.807	0.0000	448.216	0.0325	618.831	0.1961
64.526	0.0003	493.025	0.0574	624.126	0.2062
86.700	0.0004	504.731	0.0654	628.109	0.2143
254.804	0.0017	507.986	0.0677	638.893	0.2393
263.999	0.0018	537.567	0.0915	641.953	0.2475
272.616	0.0021	548.302	0.1016	646.470	0.2599
359.680	0.0076	550.488	0.1036	655.942	0.2910
365.363	0.0083	582.547	0.1399	659.682	0.3056
370.541	0.0090	590.173	0.1499	665.317	0.3351
437.782	0.0280	602.414	0.1679	668.037	0.3674

Table 277. Test data for specimen 741–29

Test Number	: 294	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 304.5 MPa	Ultimate Stress	: 638.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.328	0.0001	459.563	0.0498	583.828	0.1908
39.274	0.0001	479.887	0.0646	589.322	0.2019
96.456	0.0003	482.716	0.0667	601.708	0.2302
230.596	0.0011	485.319	0.0688	602.576	0.2323
241.127	0.0012	522.525	0.1029	605.901	0.2408
250.722	0.0014	524.501	0.1051	617.661	0.2756
346.080	0.0063	536.260	0.1184	620.793	0.2869
351.940	0.0070	554.767	0.1425	626.818	0.3111
390.453	0.0150	556.261	0.1447	630.480	0.3286
428.097	0.0310	564.984	0.1579	633.469	0.3461
431.982	0.0330	582.575	0.1886	637.902	0.4001

Table 278. Test data for specimen 74–230

Test Number	: 295	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 299.4 MPa	Ultimate Stress	: 631.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
17.452	0.0001	394.430	0.0148	548.051	0.1129
58.657	0.0002	400.309	0.0165	572.727	0.1417
69.006	0.0002	422.208	0.0246	574.421	0.1439
90.537	0.0004	460.964	0.0447	586.662	0.1619
102.198	0.0004	478.615	0.0559	594.791	0.1756
196.364	0.0010	481.876	0.0581	600.694	0.1871
207.686	0.0011	509.102	0.0779	609.064	0.2057
257.914	0.0020	511.908	0.0801	612.741	0.2150
315.230	0.0043	514.521	0.0823	619.612	0.2365
320.857	0.0047	543.842	0.1085	622.709	0.2484
354.954	0.0076	545.922	0.1107	631.611	0.3220

Table 279. Test data for specimen 742–25

Test Number	: 024	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 269.0 MPa	Ultimate Stress	: 575.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
103.90	0.0003	337.39	0.0109	517.03	0.1733
147.70	0.0009	348.85	0.0146	533.05	0.2090
192.53	0.0017	368.48	0.0230	545.09	0.2437
223.79	0.0019	392.33	0.0380	552.02	0.2650
235.31	0.0021	415.14	0.0562	555.85	0.2854
258.16	0.0028	438.00	0.0767	564.23	0.3238
273.43	0.0034	456.49	0.0934	567.11	0.3468
283.93	0.0041	471.29	0.1059	571.27	0.3814
294.13	0.0048	478.28	0.1134	573.37	0.4057
304.25	0.0055	478.15	0.1162	573.85	0.4243
310.71	0.0062	493.35	0.1355	574.58	0.4486
322.71	0.0079	506.11	0.1544	575.08	0.4701
329.47	0.0091				

Table 280. Test data for specimen 742–26

Test Number	: 025	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 261.0 MPa	Ultimate Stress	: 536.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
47.90	0.0000	293.22	0.0064	465.58	0.1573
93.90	0.0003	299.93	0.0074	464.49	0.1640
139.66	0.0009	310.53	0.0106	481.61	0.1941
173.46	0.0014	319.42	0.0144	498.93	0.2307
209.25	0.0020	332.15	0.0219	511.09	0.2647
222.43	0.0021	346.29	0.0334	514.61	0.2804
239.01	0.0024	367.51	0.0524	523.32	0.3161
251.46	0.0029	386.79	0.0705	530.14	0.3543
270.91	0.0041	405.10	0.0885	532.31	0.3751
281.95	0.0050	427.53	0.1091	535.15	0.4148
285.06	0.0053	451.26	0.1376	536.71	0.4528
289.33	0.0058	461.36	0.1511	536.81	0.4799

Table 281. Test data for specimen 744–07

Test Number	: 187	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 281.7 MPa	Ultimate Stress	: 606.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
33.818	0.0003	408.357	0.0401	527.097	0.1875
44.883	0.0004	411.123	0.0421	540.350	0.2185
55.857	0.0004	437.230	0.0635	541.314	0.2207
77.949	0.0006	464.449	0.0909	547.194	0.2363
89.356	0.0006	473.573	0.1014	561.218	0.2788
232.092	0.0020	480.546	0.1100	566.519	0.2966
249.235	0.0024	489.602	0.1222	581.893	0.3571
298.291	0.0048	490.999	0.1244	585.170	0.3727
303.130	0.0051	515.096	0.1633	595.580	0.4292
311.135	0.0057	516.205	0.1655	602.809	0.4833
405.306	0.0380	517.265	0.1677	605.942	0.5303

Table 282. Test data for specimen 744–08

Test Number	: 185	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 278.2 MPa	Ultimate Stress	: 619.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.425	0.0001	402.243	0.0303	565.723	0.1827
34.320	0.0002	406.424	0.0325	578.255	0.2080
87.225	0.0005	475.349	0.0774	579.174	0.2103
98.087	0.0006	488.694	0.0883	580.142	0.2125
109.579	0.0006	491.016	0.0905	596.206	0.2543
204.584	0.0013	493.774	0.0927	599.787	0.2654
268.360	0.0031	533.692	0.1349	602.932	0.2763
274.404	0.0034	535.579	0.1371	603.609	0.2784
326.839	0.0073	537.418	0.1394	610.577	0.3059
331.895	0.0080	562.965	0.1781	614.786	0.3266
383.160	0.0217	564.465	0.1804	619.238	0.3648

Table 283. Test data for specimen 74–119

Test Number	: 190	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 267.5 MPa	Ultimate Stress	: 587.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
13.981	0.0001	326.357	0.0097	499.928	0.1205
26.410	0.0002	369.254	0.0227	501.758	0.1225
78.205	0.0006	373.821	0.0247	520.740	0.1453
88.876	0.0006	390.471	0.0329	522.426	0.1473
99.701	0.0007	394.411	0.0350	525.365	0.1516
111.803	0.0008	420.986	0.0516	545.743	0.1826
123.221	0.0009	432.745	0.0599	564.725	0.2208
212.906	0.0020	437.534	0.0635	572.192	0.2407
244.838	0.0029	440.256	0.0656	578.166	0.2603
295.288	0.0058	467.669	0.0886	584.815	0.2938
302.346	0.0064	472.477	0.0927	587.561	0.3302

Table 284. Test data for specimen 743–13

Test Number	: 197	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 265.8 MPa	Ultimate Stress	: 647.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
12.849	0.0001	428.458	0.0438	589.825	0.2019
66.522	0.0006	482.969	0.0799	594.161	0.2105
77.323	0.0006	500.361	0.0936	606.349	0.2378
229.079	0.0023	502.914	0.0959	610.204	0.2479
236.103	0.0026	537.746	0.1288	621.525	0.2825
242.964	0.0028	539.673	0.1311	624.416	0.2929
325.196	0.0084	541.889	0.1335	631.498	0.3242
331.050	0.0091	568.627	0.1671	633.810	0.3369
366.093	0.0159	570.313	0.1694	639.350	0.3694
402.582	0.0300	577.395	0.1804	642.675	0.4003
424.396	0.0414	588.813	0.1999	646.866	0.4810

Table 285. Test data for specimen 743–14

Test Number	: 198	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 260.3 MPa	Ultimate Stress	: 613.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
9.666	0.0000	391.837	0.0241	545.340	0.1374
21.484	0.0001	396.762	0.0261	547.040	0.1394
61.626	0.0004	444.860	0.0513	555.395	0.1498
83.460	0.0006	448.149	0.0534	565.741	0.1643
205.648	0.0018	451.252	0.0554	567.101	0.1664
214.581	0.0020	474.641	0.0716	572.639	0.1748
222.882	0.0022	487.732	0.0817	583.617	0.1943
291.051	0.0055	490.257	0.0837	588.911	0.2050
295.908	0.0058	517.896	0.1080	599.015	0.2288
304.272	0.0065	519.888	0.1101	603.435	0.2420
364.849	0.0154	530.574	0.1210	613.490	0.2991

Table 286. Test data for specimen 74–130

Test Number	: 199	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 272.3 MPa	Ultimate Stress	: 624.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.372	0.0001	394.609	0.0265	559.656	0.1374
39.398	0.0003	413.752	0.0345	563.230	0.1416
93.048	0.0007	418.046	0.0365	581.786	0.1646
116.548	0.0009	462.364	0.0601	583.303	0.1667
163.079	0.0013	465.737	0.0621	592.900	0.1816
242.531	0.0026	469.022	0.0641	599.166	0.1923
249.728	0.0029	501.786	0.0862	603.279	0.2009
273.365	0.0041	507.025	0.0902	611.749	0.2207
325.777	0.0090	517.404	0.0983	615.519	0.2312
331.133	0.0098	541.198	0.1189	620.660	0.2517
355.240	0.0143	551.774	0.1291	624.674	0.2907

Table 287. Test data for specimen 742–16

Test Number	: 022	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 268.6 MPa	Ultimate Stress	: 602.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
48.46	0.0000	328.25	0.0076	477.92	0.0846
92.80	0.0003	335.89	0.0085	498.19	0.0996
129.82	0.0008	342.28	0.0094	518.24	0.1178
162.57	0.0012	351.81	0.0111	536.80	0.1375
188.33	0.0018	360.03	0.0131	550.27	0.1560
215.98	0.0021	374.07	0.0178	563.34	0.1751
229.75	0.0022	385.15	0.0224	575.95	0.1972
253.17	0.0029	399.45	0.0299	584.19	0.2167
264.85	0.0033	416.92	0.0367	591.43	0.2375
285.26	0.0044	433.97	0.0488	597.46	0.2601
303.68	0.0054	450.14	0.0609	600.29	0.2797
311.15	0.0059	461.65	0.0695	602.13	0.2970
320.93	0.0068	476.65	0.0815	602.32	0.3098

Table 288. Test data for specimen 742–17

Test Number	: 023	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 267.7 MPa	Ultimate Stress	: 579.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
43.97	0.0000	311.68	0.0075	456.70	0.0887
91.10	0.0004	320.87	0.0088	479.34	0.1045
141.86	0.0010	328.31	0.0101	501.87	0.1240
188.56	0.0019	339.56	0.0131	533.88	0.1580
222.89	0.0024	349.86	0.0168	548.18	0.1772
239.20	0.0027	358.75	0.0203	559.53	0.1963
248.53	0.0031	380.05	0.0313	572.39	0.2259
262.01	0.0036	403.69	0.0466	577.56	0.2451
277.78	0.0045	427.01	0.0628	579.42	0.2695
294.96	0.0057	446.97	0.0775	579.69	0.2911
305.05	0.0067	457.64	0.0851		

Table 289. Test data for specimen 742–22

Test Number	: 182	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 269.8 MPa	Ultimate Stress	: 626.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
29.307	0.0001	450.635	0.0601	555.718	0.1472
44.895	0.0002	453.035	0.0617	561.320	0.1533
151.596	0.0009	473.476	0.0760	571.992	0.1650
162.621	0.0010	475.586	0.0776	573.344	0.1664
184.346	0.0012	477.702	0.0792	588.411	0.1857
280.332	0.0042	496.322	0.0935	596.910	0.1974
285.417	0.0045	513.175	0.1071	601.111	0.2041
400.235	0.0334	515.010	0.1086	603.042	0.2075
423.110	0.0425	523.509	0.1155	608.403	0.2175
425.679	0.0441	526.841	0.1185	618.737	0.2431
448.433	0.0585	552.869	0.1441	626.125	0.3040

Table 290. Test data for specimen 742–23

Test Number	: 183	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 267.7 MPa	Ultimate Stress	: 624.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
7.838	0.0001	452.588	0.0609	545.063	0.1425
18.933	0.0001	458.157	0.0646	566.546	0.1703
60.733	0.0005	461.162	0.0670	578.207	0.1885
160.862	0.0012	473.171	0.0759	593.351	0.2171
171.527	0.0013	475.804	0.0779	595.238	0.2212
256.719	0.0033	478.895	0.0802	599.835	0.2324
262.796	0.0036	527.837	0.1238	612.851	0.2728
331.949	0.0091	529.870	0.1261	615.947	0.2859
354.187	0.0131	532.289	0.1285	616.383	0.2881
359.040	0.0143	540.902	0.1378	621.270	0.3192
364.377	0.0158	542.934	0.1401	624.221	0.3676

Table 291. Test data for specimen 74–110

Test Number	: 184	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 259.2 MPa	Ultimate Stress	: 607.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
27.251	0.0003	269.609	0.0045	417.156	0.0544
36.763	0.0003	299.651	0.0073	420.523	0.0568
95.948	0.0007	305.830	0.0080	505.387	0.1330
106.593	0.0008	311.627	0.0088	507.661	0.1354
129.649	0.0010	362.388	0.0226	515.644	0.1446
140.526	0.0011	367.439	0.0249	518.789	0.1486
183.265	0.0015	372.278	0.0271	525.515	0.1571
192.898	0.0016	388.531	0.0361	527.160	0.1592
201.932	0.0018	392.619	0.0384	541.579	0.1797
259.569	0.0039	396.330	0.0407	548.450	0.1900
264.765	0.0042	413.894	0.0521	554.159	0.1985

Table 292. Test data for specimen 741–04

Test Number	: 020	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 257.5 MPa	Ultimate Stress	: 620.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
57.76	0.0001	336.51	0.0097	505.01	0.0943
84.35	0.0003	349.61	0.0118	526.11	0.1091
108.16	0.0005	361.78	0.0143	544.66	0.1268
132.20	0.0008	375.38	0.0179	561.54	0.1466
156.26	0.0012	389.25	0.0226	575.34	0.1645
180.26	0.0016	400.36	0.0268	593.78	0.1967
199.16	0.0020	410.97	0.0316	605.06	0.2220
216.72	0.0021	425.03	0.0385	614.36	0.2574
226.06	0.0022	449.49	0.0533	617.97	0.2783
240.32	0.0026	464.93	0.0634	620.32	0.2996
328.50	0.0086	480.00	0.0742	620.54	0.3100
332.62	0.0092	481.96	0.0770	620.52	0.3306

Table 293. Test data for specimen 741–05

Test Number	: 021	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 259.1 MPa	Ultimate Stress	: 616.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.28	0.0000	348.16	0.0102	551.58	0.1684
65.38	0.0001	355.90	0.0114	560.05	0.1884
88.01	0.0003	366.76	0.0135	569.32	0.2109
107.09	0.0004	373.19	0.0152	576.12	0.2301
133.95	0.0008	385.18	0.0188	583.73	0.2527
165.32	0.0012	395.22	0.0225	593.51	0.2900
192.16	0.0017	409.99	0.0289	598.13	0.3141
209.14	0.0019	424.77	0.0375	601.79	0.3379
224.96	0.0020	443.70	0.0500	604.62	0.3558
239.70	0.0024	462.41	0.0649	607.18	0.3778
249.73	0.0027	478.24	0.0784	610.03	0.4046
264.87	0.0035	481.27	0.0823	614.29	0.4488
282.59	0.0043	497.88	0.0978	615.70	0.4714
301.23	0.0054	512.65	0.1115	616.36	0.4978
319.14	0.0069	526.86	0.1293	616.73	0.5243
328.20	0.0077	540.49	0.1494		

Table 294. Test data for specimen 744–40

Test Number	: 042	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 171.8 MPa	Ultimate Stress	: 412.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.91	0.0000	170.80	0.0018	295.56	0.0639
51.82	0.0000	173.86	0.0019	312.41	0.0797
60.94	0.0001	176.18	0.0021	328.07	0.0942
76.80	0.0002	178.69	0.0023	343.16	0.1080
89.56	0.0002	181.06	0.0026	359.03	0.1244
103.75	0.0004	187.92	0.0036	373.28	0.1419
114.14	0.0005	192.66	0.0045	385.86	0.1599
127.29	0.0006	196.21	0.0054	396.80	0.1766
139.22	0.0008	202.49	0.0068	404.05	0.1924
148.28	0.0010	211.24	0.0080	409.30	0.2065
156.71	0.0012	221.04	0.0096	409.26	0.2067
160.85	0.0013	236.13	0.0154	407.78	0.2071
164.30	0.0015	256.44	0.0282	407.95	0.2098
167.80	0.0016	276.94	0.0463	412.30	0.2131

Table 295. Test data for specimen 743–42

Test Number	: 039	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 164.6 MPa	Ultimate Stress	: 442.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
57.58	0.0000	176.62	0.0027	358.71	0.1229
88.11	0.0002	179.68	0.0031	369.82	0.1363
123.54	0.0006	183.55	0.0038	380.25	0.1489
129.27	0.0007	190.19	0.0055	387.68	0.1592
144.82	0.0010	201.80	0.0095	398.32	0.1743
155.49	0.0013	216.24	0.0120	404.50	0.1845
161.27	0.0015	231.45	0.0149	414.05	0.2025
163.02	0.0016	243.78	0.0204	421.87	0.2191
165.82	0.0017	263.18	0.0361	428.54	0.2361
167.32	0.0018	280.88	0.0519	430.64	0.2405
168.82	0.0019	297.27	0.0669	432.81	0.2501
170.87	0.0021	313.32	0.0814	438.13	0.2694
172.67	0.0023	330.31	0.0967	441.81	0.2893
174.92	0.0024	342.43	0.1062	442.81	0.3044

Table 296. Test data for specimen 744-35

Test Number	: 259	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 193.8 MPa	Ultimate Stress	: 424.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.281	0.0003	262.187	0.0618	364.863	0.1762
66.334	0.0002	264.606	0.0641	365.439	0.1783
76.556	0.0002	271.916	0.0708	367.945	0.1805
126.358	0.0005	290.609	0.0885	380.079	0.2008
147.294	0.0007	292.808	0.0906	386.896	0.2127
187.269	0.0068	299.241	0.0972	399.391	0.2392
192.034	0.0089	315.622	0.1147	404.331	0.2483
196.248	0.0110	318.192	0.1168	409.803	0.2664
224.796	0.0309	327.131	0.1259	413.412	0.2731
233.199	0.0378	338.928	0.1429	422.166	0.3093
241.553	0.0442	347.272	0.1512	424.697	0.3363

Table 297. Test data for specimen 744-36

Test Number	: 258	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 165.2 MPa	Ultimate Stress	: 424.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.895	0.0003	259.236	0.0618	346.882	0.1505
52.240	0.0003	262.299	0.0644	357.597	0.1659
113.615	0.0004	270.063	0.0713	363.639	0.1726
134.258	0.0006	289.170	0.0885	377.679	0.1989
139.842	0.0008	291.882	0.0911	381.990	0.2011
187.211	0.0095	298.514	0.0973	394.875	0.2292
191.322	0.0117	315.744	0.1148	398.825	0.2378
205.060	0.0200	317.348	0.1172	407.730	0.2597
223.611	0.0333	323.405	0.1240	411.407	0.2684
234.886	0.0422	338.879	0.1410	417.099	0.2932
237.695	0.0442	341.474	0.1430	423.994	0.3209

Table 298. Test data for specimen 74-263

Test Number	: 257	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 179.9 MPa	Ultimate Stress	: 436.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
38.320	0.0002	198.728	0.0073	336.859	0.0937
40.152	0.0002	226.304	0.0196	358.528	0.1117
62.734	0.0003	230.316	0.0219	367.223	0.1200
72.026	0.0005	241.648	0.0284	386.259	0.1384
101.958	0.0007	262.365	0.0413	393.259	0.1455
112.620	0.0008	272.381	0.0478	405.966	0.1595
140.380	0.0014	275.514	0.0500	410.075	0.1671
148.405	0.0016	294.507	0.0628	423.768	0.1850
155.550	0.0019	304.683	0.0697	423.171	0.1873
181.372	0.0036	307.758	0.0718	430.695	0.2054
193.190	0.0056	326.420	0.0852	436.330	0.2253

Table 299. Test data for specimen 744–26

Test Number	: 336	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 192.7 MPa	Ultimate Stress	: 440.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
106.11	0.0001	280.42	0.0515	375.61	0.1395
142.17	0.0003	289.10	0.0580	380.92	0.1462
171.87	0.0012	291.95	0.0603	384.35	0.1506
196.70	0.0039	294.72	0.0624	392.74	0.1617
201.56	0.0049	297.52	0.0646	398.63	0.1706
206.97	0.0065	305.61	0.0713	405.55	0.1817
212.68	0.0087	308.19	0.0735	410.35	0.1902
226.58	0.0154	310.94	0.0756	416.01	0.2021
230.71	0.0177	318.65	0.0822	417.15	0.2043
234.62	0.0201	326.10	0.0889	419.29	0.2110
238.39	0.0224	335.70	0.0976	425.77	0.2248
248.94	0.0292	342.64	0.1043	428.38	0.2313
252.34	0.0314	351.49	0.1130	431.64	0.2402
262.02	0.0381	357.75	0.1196	433.42	0.2488
265.25	0.0405	365.93	0.1285	435.67	0.2581
277.41	0.0493	371.80	0.1352	436.29	0.2603

Table 300. Test data for specimen 744–27

Test Number	: 337	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 181.0 MPa	Ultimate Stress	: 420.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.87	0.0001	258.45	0.0532	376.49	0.1870
86.83	0.0003	268.36	0.0621	382.10	0.1956
140.52	0.0005	280.12	0.0731	387.60	0.2043
160.25	0.0010	291.47	0.0841	391.28	0.2136
172.60	0.0017	296.00	0.0885	393.48	0.2160
190.12	0.0046	304.61	0.0974	398.73	0.2277
195.82	0.0068	315.12	0.1084	404.59	0.2395
200.48	0.0089	321.17	0.1150	406.19	0.2485
210.77	0.0150	327.10	0.1216	411.17	0.2577
214.15	0.0173	331.05	0.1259	411.35	0.2601
216.89	0.0193	336.75	0.1326	414.90	0.2698
226.19	0.0262	338.58	0.1347	415.08	0.2720
232.02	0.0308	347.41	0.1456	416.85	0.2789
240.32	0.0376	355.92	0.1564	418.48	0.2880
245.63	0.0422	362.16	0.1650	419.34	0.2900
253.46	0.0488	369.80	0.1759	420.58	0.2969

Table 301. Test data for specimen 742–40

Test Number	: 170	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 153.7 MPa	Ultimate Stress	: 452.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	286.83	0.0490		
78.74	0.0002	347.63	0.0980		
145.35	0.0010	392.11	0.1374		
183.04	0.0027	426.74	0.1873		
208.12	0.0055	447.13	0.2286		
236.95	0.0154	452.68	0.2669		
264.70	0.0321				

Table 302. Test data for specimen 742–41

Test Number	: 175	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 190.3 MPa	Ultimate Stress	: 483.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	236.23	0.0083	335.07	0.0561
43.48	0.0001	241.02	0.0093	346.32	0.0638
74.85	0.0004	246.71	0.0107	359.87	0.0727
111.79	0.0008	251.05	0.0119	368.82	0.0789
133.01	0.0012	254.74	0.0131	381.42	0.0877
146.65	0.0014	259.29	0.0147	394.19	0.0970
155.17	0.0017	263.38	0.0163	410.61	0.1074
162.99	0.0019	266.98	0.0178	422.27	0.1173
171.50	0.0022	271.22	0.0195	434.15	0.1290
180.07	0.0025	276.26	0.0218	445.44	0.1413
188.89	0.0030	280.21	0.0237	454.93	0.1531
195.31	0.0033	286.20	0.0270	461.77	0.1633
204.43	0.0039	293.15	0.0307	472.59	0.1816
210.66	0.0045	303.88	0.0366	481.07	0.2002
218.08	0.0053	314.33	0.0430	483.35	0.2125
221.83	0.0058	320.48	0.0468	483.13	0.2179
228.90	0.0068	327.32	0.0511		

Table 303. Test data for specimen 74–246

Test Number	: 174	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 184.4 MPa	Ultimate Stress	: 481.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.00	0.0000	232.55	0.0097	363.33	0.0877
39.37	0.0001	236.37	0.0108	383.42	0.1008
72.32	0.0003	241.09	0.0123	403.82	0.1187
106.72	0.0008	244.95	0.0138	415.39	0.1301
136.63	0.0014	249.46	0.0157	422.87	0.1381
145.89	0.0017	256.79	0.0187	430.44	0.1468
164.40	0.0023	264.17	0.0222	438.15	0.1570
175.54	0.0028	273.09	0.0270	444.12	0.1663
180.37	0.0031	280.12	0.0308	451.56	0.1776
193.85	0.0039	292.59	0.0389	458.30	0.1904
200.01	0.0045	299.76	0.0434	466.64	0.2072
204.99	0.0048	306.59	0.0478	466.05	0.2076
210.01	0.0054	314.15	0.0535	469.41	0.2174
215.08	0.0061	322.12	0.0588	473.03	0.2277
221.88	0.0072	331.36	0.0655	476.73	0.2426
225.01	0.0080	340.36	0.0714	480.22	0.2616
229.03	0.0088	350.68	0.0789	481.67	0.2752

Table 304. Test data for specimen 742–28

Test Number	: 325	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 203.5 MPa	Ultimate Stress	: 473.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
17.080	0.0001	300.370	0.0347	406.440	0.1224
30.040	0.0002	310.690	0.0414	421.070	0.1400
50.360	0.0003	313.980	0.0436	426.140	0.1467
90.470	0.0006	338.650	0.0612	427.780	0.1489
100.950	0.0007	347.250	0.0678	439.520	0.1666
171.860	0.0018	350.000	0.0699	444.480	0.1755
190.750	0.0026	370.940	0.0875	452.860	0.1932
196.240	0.0029	378.240	0.0939	455.930	0.2025
245.040	0.0087	380.670	0.0961	462.940	0.2261
262.330	0.0145	398.320	0.1137	469.300	0.2473
267.560	0.0167	404.400	0.1202	473.290	0.2721

Table 305. Test data for specimen 742–29

Test Number	: 326	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 215.2 MPa	Ultimate Stress	: 474.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
27.120	0.0002	268.040	0.0128	408.120	0.1026
44.370	0.0002	272.980	0.0146	410.450	0.1047
55.480	0.0002	309.550	0.0322	417.250	0.1114
86.410	0.0003	313.520	0.0345	429.960	0.1246
130.880	0.0005	324.890	0.0411	437.570	0.1335
140.790	0.0006	352.490	0.0588	450.860	0.1513
150.030	0.0007	355.710	0.0610	453.750	0.1559
192.710	0.0018	365.020	0.0675	461.870	0.1691
198.660	0.0020	382.350	0.0805	465.270	0.1759
214.220	0.0029	390.510	0.0871	470.750	0.1892
251.920	0.0080	393.070	0.0892	474.310	0.2089

Table 306. Test data for specimen 74–130

Test Number	: 324	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 235.4 MPa	Ultimate Stress	: 517.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
21.010	0.0001	304.520	0.0274	436.450	0.1378
23.740	0.0001	308.170	0.0297	451.880	0.1554
96.150	0.0002	334.460	0.0476	456.960	0.1620
108.410	0.0003	343.580	0.0541	459.100	0.1643
160.820	0.0006	346.580	0.0564	477.670	0.1908
169.310	0.0006	368.940	0.0739	482.190	0.1984
192.110	0.0012	379.530	0.0827	492.940	0.2170
229.530	0.0026	401.270	0.1025	497.070	0.2283
248.700	0.0042	408.440	0.1091	505.340	0.2467
253.750	0.0050	411.000	0.1114	508.980	0.2537
293.090	0.0205	428.040	0.1289	517.560	0.2835

Table 307. Test data for specimen 742–27

Test Number	: 052	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 174.9 MPa	Ultimate Stress	: 454.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.34	0.0000	236.55	0.0078	423.15	0.1632
83.52	0.0002	247.28	0.0121	428.95	0.1728
109.38	0.0005	259.81	0.0193	434.04	0.1824
131.30	0.0008	275.30	0.0296	438.59	0.1926
148.35	0.0011	292.41	0.0421	441.87	0.2008
163.85	0.0016	308.93	0.0550	445.91	0.2120
171.51	0.0020	326.09	0.0691	448.80	0.2181
179.31	0.0024	342.45	0.0820	448.87	0.2225
186.66	0.0029	358.21	0.0947	449.19	0.2264
192.52	0.0034	371.39	0.1038	451.04	0.2320
199.12	0.0042	385.51	0.1169	452.69	0.2384
208.25	0.0049	396.91	0.1286	454.29	0.2435
218.27	0.0057	405.83	0.1390	454.13	0.2457
222.08	0.0061	412.48	0.1477	454.26	0.2553
228.37	0.0067	417.64	0.1549		

Table 308. Test data for specimen 744-06

Test Number	: 330	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 185.4 MPa	Ultimate Stress	: 448.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.800	0.0001	267.360	0.0351	371.110	0.1235
30.150	0.0002	270.580	0.0374	373.180	0.1257
41.190	0.0002	294.990	0.0551	385.350	0.1391
62.670	0.0003	297.820	0.0573	389.150	0.1435
149.200	0.0010	300.720	0.0596	391.090	0.1457
155.050	0.0012	322.170	0.0772	406.950	0.1657
160.640	0.0014	324.720	0.0794	413.350	0.1745
211.060	0.0067	327.270	0.0816	426.950	0.1964
215.910	0.0080	349.090	0.1013	430.730	0.2034
232.460	0.0143	351.270	0.1036	442.920	0.2301
257.030	0.0283	368.970	0.1212	447.860	0.2504

Table 309. Test data for specimen 744-09

Test Number	: 331	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 197.8 MPa	Ultimate Stress	: 507.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
13.390	0.0001	282.940	0.0302	414.890	0.1218
39.590	0.0001	287.000	0.0325	428.640	0.1349
72.350	0.0002	298.920	0.0391	430.800	0.1371
116.650	0.0003	321.040	0.0521	448.850	0.1570
135.280	0.0004	324.530	0.0544	450.790	0.1591
173.970	0.0015	334.960	0.0608	456.070	0.1657
179.350	0.0017	354.370	0.0738	472.140	0.1880
200.100	0.0030	357.470	0.0761	476.340	0.1956
233.810	0.0087	366.680	0.0825	484.930	0.2117
239.340	0.0104	383.880	0.0956	496.410	0.2385
244.390	0.0122	394.820	0.1042	507.070	0.2726

Table 310. Test data for specimen 74-120

Test Number	: 332	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 176.6 MPa	Ultimate Stress	: 453.8 MPa

Experimental Data Not Available.

Table 311. Test data for specimen 744-18

Test Number	: 233a	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 228.5 MPa	Ultimate Stress	: 510.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
8.442	0.0001	230.833	0.0083	350.463	0.0605
20.800	0.0001	239.849	0.0102	370.195	0.0727
41.886	0.0002	253.007	0.0138	379.351	0.0787
53.131	0.0002	254.654	0.0143	413.145	0.1031
129.137	0.0006	256.199	0.0148	428.086	0.1154
137.525	0.0007	281.982	0.0247	431.846	0.1185
144.719	0.0008	284.363	0.0258	457.804	0.1431
199.449	0.0040	286.699	0.0268	469.929	0.1570
203.403	0.0044	308.091	0.0372	490.996	0.1861
207.119	0.0047	327.487	0.0474	493.424	0.1901
228.390	0.0079	331.087	0.0493	510.474	0.2396

Table 312. Test data for specimen 743-15

Test Number	: 262	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 180.0 MPa	Ultimate Stress	: 503.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
40.729	0.0002	259.018	0.0213	423.949	0.1307
60.887	0.0002	264.040	0.0234	426.338	0.1329
79.952	0.0003	294.467	0.0387	428.087	0.1351
90.021	0.0004	306.148	0.0451	449.406	0.1571
121.225	0.0005	309.889	0.0474	454.807	0.1638
129.808	0.0006	349.228	0.0715	465.867	0.1780
137.497	0.0007	364.990	0.0822	474.926	0.1915
196.295	0.0043	368.007	0.0845	484.068	0.2092
201.881	0.0050	384.862	0.0980	488.503	0.2187
207.112	0.0058	398.452	0.1086	497.634	0.2428
242.294	0.0146	401.080	0.1108	503.755	0.2803

Table 313. Test data for specimen 74-270

Test Number	: 246	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 182.2 MPa	Ultimate Stress	: 495.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
41.840	0.0002	295.090	0.0383	412.530	0.1235
57.710	0.0002	306.420	0.0447	429.420	0.1407
78.370	0.0002	310.070	0.0469	435.740	0.1475
117.510	0.0004	340.570	0.0664	437.600	0.1496
139.570	0.0006	343.810	0.0685	454.760	0.1712
192.540	0.0037	353.080	0.0749	459.890	0.1780
198.850	0.0044	376.600	0.0924	472.920	0.2007
216.710	0.0069	379.270	0.0945	481.740	0.2187
249.270	0.0161	387.770	0.1013	484.770	0.2257
265.150	0.0228	403.140	0.1149	491.050	0.2437
269.810	0.0251	410.190	0.1213	495.010	0.2637

Table 314. Test data for specimen 742–18

Test Number	: 051	Test Temp.	: 290℃
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 166.2 MPa	Ultimate Stress	: 485.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.986	0.0000	183.780	0.0024	254.680	0.0105
69.838	0.0001	187.960	0.0027	261.500	0.0132
86.240	0.0002	194.900	0.0032	270.170	0.0171
100.320	0.0003	196.620	0.0033	328.240	0.0545
130.710	0.0007	197.700	0.0034	340.230	0.0635
137.260	0.0008	205.710	0.0038	356.170	0.0754
141.250	0.0009	209.150	0.0039	411.380	0.1169
157.350	0.0013	212.740	0.0040	424.790	0.1300
161.240	0.0015	226.360	0.0046	458.500	0.1721
165.070	0.0016	229.900	0.0048	464.560	0.1816
179.840	0.0022	233.920	0.0051	485.050	0.2446

Table 315. Test data for specimen 742–15

Test Number	: 241	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 178.9 MPa	Ultimate Stress	: 516.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.830	0.0002	298.520	0.0375	433.390	0.1405
63.120	0.0002	326.950	0.0553	435.520	0.1427
102.860	0.0006	336.860	0.0618	452.420	0.1611
142.950	0.0013	340.150	0.0638	459.900	0.1700
163.120	0.0020	364.040	0.0814	476.920	0.1929
168.930	0.0024	373.410	0.0880	481.150	0.2003
220.410	0.0068	376.230	0.0902	492.650	0.2206
238.050	0.0101	397.550	0.1076	501.160	0.2393
243.040	0.0116	405.280	0.1142	504.160	0.2465
282.680	0.0285	407.810	0.1163	512.700	0.2740
294.720	0.0355	426.540	0.1338	515.990	0.3002

Table 316. Test data for specimen 742–24

Test Number	: 240	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 184.2 MPa	Ultimate Stress	: 509.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
40.328	0.0002	285.582	0.0325	402.677	0.1060
73.263	0.0003	289.792	0.0347	421.982	0.1212
97.634	0.0004	301.985	0.0412	424.537	0.1233
130.710	0.0006	324.783	0.0540	439.691	0.1364
145.143	0.0010	328.407	0.0562	442.124	0.1386
172.470	0.0020	339.095	0.0627	444.447	0.1409
194.911	0.0038	359.479	0.0757	466.379	0.1628
201.229	0.0045	369.238	0.0821	472.485	0.1697
235.006	0.0111	372.374	0.0843	489.163	0.1910
240.667	0.0127	391.548	0.0976	498.985	0.2086
257.307	0.0189	394.408	0.0996	508.323	0.2346

Table 317. Test data for specimen 74-109

Test Number	: 242	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10000 h
Yield Stress	: 172.0 MPa	Ultimate Stress	: 476.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
41.960	0.0002	278.190	0.0388	401.560	0.1428
45.770	0.0002	302.930	0.0558	416.700	0.1600
61.070	0.0001	312.370	0.0626	422.110	0.1665
101.970	0.0004	315.120	0.0648	423.850	0.1688
125.570	0.0008	336.710	0.0817	436.970	0.1866
147.750	0.0015	344.530	0.0880	441.460	0.1932
204.990	0.0065	346.960	0.0904	452.320	0.2130
222.950	0.0107	366.630	0.1077	460.950	0.2303
228.350	0.0123	373.610	0.1143	464.570	0.2390
264.110	0.0298	375.920	0.1164	471.980	0.2601
274.860	0.0365	393.400	0.1339	476.750	0.2852

Table 318. Test data for specimen 741–06

Test Number	: 048	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 172.0 MPa	Ultimate Stress	: 500.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
43.97	0.0000	206.82	0.0035	446.50	0.1035
66.29	0.0001	215.45	0.0037	455.21	0.1108
83.95	0.0002	220.15	0.0039	465.41	0.1194
99.14	0.0003	229.32	0.0041	472.49	0.1267
107.85	0.0004	237.45	0.0044	478.40	0.1338
120.05	0.0006	249.54	0.0058	482.94	0.1390
127.18	0.0007	254.97	0.0067	483.13	0.1428
136.08	0.0008	263.92	0.0084	483.42	0.1449
149.54	0.0011	326.74	0.0309	485.26	0.1473
155.78	0.0013	344.39	0.0399	487.52	0.1511
174.93	0.0020	367.85	0.0534	490.45	0.1554
185.04	0.0025	392.09	0.0683	493.15	0.1603
196.53	0.0031	419.63	0.0864	495.99	0.1664
202.46	0.0033	434.98	0.0972		

Table 319. Test data for specimen 742–09

Test Number	: 047	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 170.3 MPa	Ultimate Stress	: 485.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
45.5000	0.0000	209.8600	0.0038	361.8700	0.0570
87.0190	0.0003	213.2400	0.0039	374.6400	0.0656
113.9700	0.0005	220.2400	0.0042	387.9400	0.0744
129.9500	0.0008	226.1700	0.0043	399.1400	0.0823
138.3100	0.0009	234.0500	0.0046	410.2100	0.0908
148.3300	0.0012	243.7800	0.0056	418.6900	0.0972
153.3400	0.0013	256.2800	0.0078	439.2100	0.1128
160.6600	0.0015	270.6000	0.0112	453.8700	0.1281
168.4700	0.0019	284.8100	0.0157	465.9400	0.1432
173.2300	0.0020	291.2200	0.0181	475.7700	0.1594
181.0000	0.0024	299.0400	0.0211	482.4100	0.1741
185.1700	0.0026	311.2500	0.0270	484.5700	0.1784
194.0500	0.0031	322.6900	0.0327	485.1600	0.1813
199.9300	0.0035	337.8300	0.0416	484.9300	0.1905
205.9000	0.0037	349.0300	0.0487	485.1000	0.1967

Table 320. Test data for specimen 753–40

Test Number	: 032	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 313.5 MPa	Ultimate Stress	: 610.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
77.16	0.0001	365.32	0.0062	489.21	0.0761
118.01	0.0003	371.61	0.0069	507.80	0.0934
160.83	0.0007	381.23	0.0083	527.54	0.1132
197.95	0.0012	388.16	0.0099	548.51	0.1418
209.02	0.0014	394.15	0.0114	559.04	0.1605
227.05	0.0016	400.38	0.0133	574.58	0.1971
235.44	0.0016	412.09	0.0179	587.16	0.2345
243.44	0.0017	423.05	0.0231	594.90	0.2637
279.36	0.0023	440.90	0.0341	601.22	0.2945
306.14	0.0029	464.33	0.0519	606.19	0.3291
328.63	0.0037	480.06	0.0650	609.41	0.3687
343.73	0.0045	487.62	0.0719	610.35	0.4031
357.23	0.0054				

Table 321. Test data for specimen 753–41

Test Number	: 033	Test Temp.	: 25°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 330.5 MPa	Ultimate Stress	: 589.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
68.82	0.0001	353.02	0.0056	503.22	0.0919
111.68	0.0004	362.44	0.0067	512.45	0.0990
156.27	0.0008	370.87	0.0080	525.70	0.1146
189.39	0.0013	379.64	0.0096	536.89	0.1304
204.14	0.0015	395.01	0.0135	553.88	0.1595
213.28	0.0016	406.69	0.0182	566.90	0.1937
226.29	0.0017	422.55	0.0259	576.29	0.2257
243.89	0.0019	441.60	0.0382	583.13	0.2586
288.66	0.0027	463.10	0.0548	587.81	0.2923
312.30	0.0035	479.22	0.0683	589.38	0.3107
327.04	0.0040	482.62	0.0712	589.78	0.3362
338.88	0.0047	484.99	0.0744	589.79	0.3585
344.82	0.0051				

Table 322. Test data for specimen 753–30

Test Number	: 203	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000h
Yield Stress	: 315.6 MPa	Ultimate Stress	: 609.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
18.907	0.0002	395.921	0.0176	562.345	0.1509
42.475	0.0005	440.565	0.0385	571.550	0.1668
96.150	0.0008	459.322	0.0498	572.611	0.1688
192.666	0.0014	462.817	0.0520	583.648	0.1931
204.985	0.0015	499.739	0.0794	584.419	0.1951
249.778	0.0020	502.294	0.0817	590.347	0.2114
306.663	0.0036	505.185	0.0840	594.202	0.2237
323.363	0.0045	533.090	0.1115	598.685	0.2400
331.797	0.0051	535.115	0.1138	602.637	0.2583
368.503	0.0099	544.947	0.1256	607.022	0.2849
390.731	0.0157	557.140	0.1425	609.047	0.3146

Table 323. Test data for specimen 754-28

Test Number	: 204	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000h
Yield Stress	: 321.7 MPa	Ultimate Stress	: 619.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
12.251	0.0001	419.960	0.0218	568.133	0.1450
34.804	0.0002	465.888	0.0456	569.396	0.1471
88.596	0.0006	469.108	0.0476	583.531	0.1745
99.875	0.0006	472.698	0.0499	584.552	0.1766
174.477	0.0011	510.280	0.0778	585.426	0.1787
186.781	0.0012	512.563	0.0798	598.930	0.2154
264.141	0.0022	517.081	0.0838	602.573	0.2285
298.523	0.0031	539.085	0.1060	609.762	0.2594
306.052	0.0033	541.028	0.1081	613.162	0.2794
368.704	0.0080	544.623	0.1121	615.300	0.2953
393.258	0.0128	560.021	0.1325	619.088	0.3533

Table 324. Test data for specimen 75-135

Test Number	: 205	Test Temp.	: 25°C
Aging Temp.	: 290°C	Aging Time	: 30,000h
Yield Stress	: 310.6 MPa	Ultimate Stress	: 630.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
16.131	0.0001	424.177	0.0274	572.696	0.1450
39.509	0.0003	460.190	0.0458	574.110	0.1473
81.564	0.0006	464.179	0.0481	589.813	0.1742
140.433	0.0011	478.702	0.0572	593.763	0.1823
260.844	0.0026	505.059	0.0754	606.978	0.2168
269.748	0.0029	507.839	0.0776	616.731	0.2518
313.876	0.0044	510.862	0.0799	617.365	0.2539
338.668	0.0060	538.951	0.1047	622.388	0.2787
346.046	0.0067	541.292	0.1070	622.680	0.2808
397.464	0.0171	551.045	0.1176	628.922	0.3303
418.774	0.0251	571.038	0.1426	630.288	0.3659

Table 325. Test data for specimen 754–21

Test Number	: 136	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000h
Yield Stress	: 355.9 MPa	Ultimate Stress	: 693.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.000	0.0000	436.450	0.0171	593.610	0.1044
48.641	0.0002	459.850	0.0241	592.740	0.1047
208.470	0.0026	471.710	0.0283	634.930	0.1531
343.960	0.0061	486.140	0.0365	663.180	0.2118
388.060	0.0092	524.430	0.0578	685.700	0.2947
413.870	0.0123	560.710	0.0819	693.660	0.3958

Table 326. Test data for specimen 754-25

Test Number	: 139	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 10,000h
Yield Stress	: 406.3MPa	Ultimate Stress	: 706.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.000	0.0000	451.910	0.0129	637.060	0.1280
34.659	0.0001	473.520	0.0182	665.550	0.1697
206.780	0.0022	488.760	0.0244	678.530	0.1957
353.210	0.0040	537.850	0.0511	688.120	0.2220
392.300	0.0058	570.150	0.0733	703.330	0.2905
427.650	0.0089	603.730	0.0980	705.940	0.3728

Table 327. Test data for specimen 752–41

Test Number	: 161	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000h
Yield Stress	: 357.9 MPa	Ultimate Stress	: 726.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
68.878	0.0001	433.740	0.0099	641.470	0.1087
104.730	0.0003	455.510	0.0132	653.230	0.1205
148.220	0.0008	469.720	0.0158	668.750	0.1401
177.710	0.0010	486.150	0.0202	678.970	0.1539
196.030	0.0012	487.380	0.0217	689.900	0.1705
219.070	0.0016	524.100	0.0358	699.930	0.1906
254.830	0.0022	551.170	0.0499	709.200	0.2176
287.150	0.0029	574.600	0.0646	717.080	0.2421
308.750	0.0034	595.730	0.0779	718.110	0.2454
354.750	0.0049	610.280	0.0877	726.010	0.2752
400.620	0.0073	622.420	0.0961	726.850	0.3031

Table 328. Test data for specimen 754-39

Test Number	: 162	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000h
Yield Stress	: 395.1 MPa	Ultimate Stress	: 722.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.000	0.0000	487.210	0.0239	668.850	0.1412
361.240	0.0060	509.070	0.0321	692.810	0.1789
396.640	0.0083	539.540	0.0467	710.940	0.2040
423.810	0.0109	579.740	0.0698	720.130	0.2679
442.600	0.0133	617.330	0.0945	722.540	0.2900
467.520	0.0184	652.490	0.1225		

Table 329. Test data for specimen 75-245

Test Number	: 167	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 30,000h
Yield Stress	: 323.1 MPa	Ultimate Stress	: 691.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
0.0000	0.0000	441.7100	0.0176	630.8700	0.1369
250.0600	0.0023	463.3100	0.0247	661.2200	0.1873
337.1400	0.0052	475.7100	0.0293	683.6300	0.2586
388.7400	0.0087	485.2900	0.0331	691.2700	0.3612
405.0500	0.0106	535.5200	0.0616		
422.8200	0.0134	582.0500	0.0937		

Table 330. Test data for specimen 751-28

Test Number	: 033	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000h
Yield Stress	: 334.7 MPa	Ultimate Stress	: 689.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
68.817	0.000	338.880	0.005	479.220	0.068
111.680	0.000	344.820	0.005	484.990	0.074
156.270	0.001	353.020	0.006	503.220	0.092
189.390	0.001	362.440	0.007	512.450	0.099
204.140	0.002	370.870	0.008	525.700	0.115
213.280	0.002	379.640	0.010	536.890	0.130
226.290	0.002	395.010	0.014	553.880	0.160
243.890	0.002	406.690	0.018	566.900	0.194
288.660	0.003	422.550	0.026	576.290	0.226
312.300	0.003	441.600	0.038	583.130	0.259
327.040	0.004	463.100	0.055	589.790	0.359

Table 331. Test data for specimen 751-29

Test Number	: 297	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000h
Yield Stress	: 352.0 MPa	Ultimate Stress	: 729.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
54.600	0.0000	445.340	0.0093	660.670	0.1059
102.720	0.0002	451.700	0.0101	677.290	0.1230
152.200	0.0005	511.560	0.0228	686.150	0.1336
190.280	0.0007	527.310	0.0279	690.990	0.1401
239.960	0.0010	544.120	0.0342	698.550	0.1508
251.660	0.0012	568.390	0.0448	702.650	0.1573
283.680	0.0017	585.260	0.0533	708.900	0.1682
353.810	0.0035	603.970	0.0638	717.000	0.1856
361.280	0.0038	614.160	0.0701	723.610	0.2034
382.340	0.0047	638.240	0.0870	725.590	0.2101
417.260	0.0068	651.250	0.0975	729.710	0.2397

Table 332 Test data for specimen 75-230

Test Number	: 298	Test Temp.	: 25°C
Aging Temp.	: 320°C	Aging Time	: 50,000h
Yield Stress	: 378.4 MPa	Ultimate Stress	: 759.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.710	0.0001	508.940	0.0237	714.680	0.1461
28.190	0.0001	567.950	0.0329	722.910	0.1596
43.390	0.0002	587.160	0.0413	726.700	0.1664
77.140	0.0003	619.600	0.0584	731.290	0.1755
135.460	0.0005	636.700	0.0692	737.430	0.1891
148.340	0.0006	639.880	0.0713	738.490	0.1914
238.630	0.0012	662.680	0.0885	742.130	0.2006
307.310	0.0020	665.240	0.0907	748.060	0.2190
364.410	0.0033	692.360	0.1171	751.520	0.2313
429.700	0.0060	698.030	0.1237	754.230	0.2429
505.220	0.0142	708.340	0.1371	759.480	0.2856

Table 333. Test data for specimen 752–25

Test Number	: 036	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 346,5 MPa	Ultimate Stress	: 667.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
73.49	0.0001	381.17	0.0061	543.88	0.0696
119.13	0.0004	397.04	0.0075	566.03	0.0871
154.98	0.0007	407.83	0.0088	588.31	0.1036
188.94	0.0011	419.41	0.0104	606.86	0.1220
199.93	0.0013	425.20	0.0112	623.27	0.1447
205.64	0.0013	433.30	0.0130	639.85	0.1730
227.79	0.0015	442.18	0.0152	649.10	0.1938
239.21	0.0017	457.15	0.0196	657.41	0.2192
263.77	0.0020	471.75	0.0253	661.75	0.2383
297.97	0.0027	484.27	0.0310	666.43	0.2619
325.15	0.0035	488.93	0.0350	667.26	0.2736
346.41	0.0043	515.86	0.0508	667.75	0.2930
364.99	0.0052				

Table 334. Test data for specimen 752–26

Test Number	: 037	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 346.5 MPa	Ultimate Stress	: 688.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
59.65	0.0000	404.74	0.0071	570.33	0.0760
93.85	0.0002	415.16	0.0081	592.85	0.0929
130.88	0.0005	420.91	0.0086	611.04	0.1059
168.71	0.0009	432.01	0.0100	625.94	0.1218
199.47	0.0013	441.47	0.0114	642.65	0.1434
207.97	0.0014	451.91	0.0133	651.15	0.1567
220.14	0.0015	461.64	0.0157	660.27	0.1739
234.09	0.0016	475.87	0.0199	668.44	0.1924
251.98	0.0019	486.96	0.0241	676.12	0.2154
277.03	0.0023	488.94	0.0264	680.67	0.2334
310.62	0.0030	510.17	0.0365	684.79	0.2525
334.08	0.0037	539.13	0.0540	688.70	0.2790
353.25	0.0043	548.02	0.0599	688.85	0.2967
386.38	0.0058				

Table 335. Test data for specimen 754-06

Test Number	: 140	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 332.7 MPa	Ultimate Stress	: 741.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
52.922	0.0003	454.660	0.0134	671.190	0.1332
204.610	0.0023	480.910	0.0183	670.790	0.1333
226.170	0.0025	495.550	0.0249	701.930	0.1747
346.910	0.0054	541.000	0.0434	725.090	0.2325
406.130	0.0081	596.460	0.0744	739.370	0.2914
434.270	0.0109	645.880	0.1070	741.080	0.3489

Table 336. Test data for specimen 754-07

Test Number	: 141	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 352.5 MPa	Ultimate Stress	: 728.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
38.296	0.0001	454.290	0.0144	663.470	0.1291
205.090	0.0020	474.210	0.0182	681.580	0.1546
227.300	0.0022	488.150	0.0231	702.230	0.1908
343.640	0.0048	528.390	0.0389	719.020	0.2465
402.370	0.0085	564.520	0.0576	719.220	0.2463
430.080	0.0111	607.110	0.0840	727.900	0.2976
		636.250	0.1036	728.490	0.2975

Table 337. Test data for specimen 754-08

Test Number	: 225	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 308.6 MPa	Ultimate Stress	: 718.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
33.260	0.0002	396.930	0.0083	662.250	0.1479
45.180	0.0002	404.440	0.0090	672.080	0.1628
61.780	0.0003	429.060	0.0121	680.680	0.1779
110.540	0.0005	482.310	0.0246	686.900	0.1909
122.510	0.0006	577.070	0.0696	696.420	0.2154
134.590	0.0007	580.460	0.0716	706.660	0.2489
208.410	0.0013	603.710	0.0883	707.070	0.2511
279.680	0.0027	606.410	0.0904	710.910	0.2691
313.330	0.0037	621.680	0.1030	711.590	0.2736
320.770	0.0040	641.880	0.1236	715.230	0.2964
373.210	0.0065	651.140	0.1329	718.730	0.3560

Table 338. Test data for specimen 75-119

Test Number	: 144	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 354.0 MPa	Ultimate Stress	: 742.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
57.819	0.0009	464.680	0.0168	647.710	0.1080
199.560	0.0034	479.370	0.0197	677.920	0.1408
218.060	0.0039	488.860	0.0235	703.990	0.1833
320.720	0.0063	513.370	0.0316	721.850	0.2267
407.600	0.0109	542.610	0.0440	735.150	0.2859
440.510	0.0136	581.790	0.0654	742.780	0.3565

Table 339. Test data for specimen 753-10

Test Number	: 200	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 316.1 MPa	Ultimate Stress	: 766.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
15.470	0.0001	257.140	0.0021	685.390	0.1009
17.770	0.0001	340.180	0.0046	707.290	0.1215
30.840	0.0002	374.850	0.0060	722.630	0.1398
41.740	0.0002	387.210	0.0067	731.250	0.1521
63.970	0.0004	393.270	0.0070	753.540	0.1986
74.670	0.0004	415.140	0.0083	757.040	0.2095
85.580	0.0005	575.470	0.0389	757.370	0.2116
119.960	0.0007	580.430	0.0408	761.310	0.2277
131.950	0.0007	621.310	0.0591	763.880	0.2412
144.250	0.0008	642.270	0.0707	765.570	0.2594
181.040	0.0011	672.290	0.0906	766.280	0.2711

Table 340. Test data for specimen 753-11

Test Number	: 201	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 344.3 MPa	Ultimate Stress	: 748.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
11.730	0.0001	251.070	0.0019	582.880	0.0449
17.140	0.0001	291.190	0.0026	611.890	0.0589
29.920	0.0002	300.100	0.0028	615.570	0.0609
40.310	0.0003	308.730	0.0031	636.160	0.0729
50.870	0.0004	341.120	0.0041	648.570	0.0810
61.090	0.0005	348.440	0.0043	689.120	0.1136
71.580	0.0005	376.080	0.0055	697.880	0.1223
82.390	0.0006	416.970	0.0077	710.000	0.1369
104.540	0.0007	446.100	0.0100	739.800	0.1898
228.180	0.0016	502.770	0.0185	746.470	0.2142
239.940	0.0017	526.130	0.0243	747.650	0.2233

Table 341. Test data for specimen 75-130

Test Number	: 202	Test Temp.	: 25°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 300.8 MPa	Ultimate Stress	: 711.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.680	0.0001	260.450	0.0025	562.070	0.0527
27.100	0.0001	268.520	0.0027	587.950	0.0680
57.420	0.0003	321.250	0.0044	602.990	0.0783
67.750	0.0004	328.040	0.0047	605.990	0.0803
112.940	0.0006	371.970	0.0066	635.380	0.1046
124.280	0.0007	406.490	0.0088	675.220	0.1519
182.390	0.0011	414.230	0.0094	686.970	0.1727
193.660	0.0012	439.280	0.0120	692.150	0.1833
204.490	0.0013	452.530	0.0140	695.610	0.1918
214.600	0.0015	486.850	0.0217	710.190	0.2560
251.850	0.0022	549.230	0.0461	710.880	0.2695

Table 342. Test data for specimen 752–16

Test Number	: 034	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 326.7 MPa	Ultimate Stress	: 703.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
76.17	0.0001	396.10	0.0074	568.50	0.0724
116.51	0.0003	403.19	0.0080	591.38	0.0877
152.92	0.0007	415.13	0.0094	613.10	0.1019
195.20	0.0013	427.70	0.0111	631.87	0.1188
202.49	0.0014	438.06	0.0130	651.39	0.1405
217.08	0.0015	447.88	0.0148	663.74	0.1569
227.52	0.0016	464.22	0.0190	674.85	0.1763
254.96	0.0019	469.79	0.0207	686.51	0.2011
293.55	0.0027	469.75	0.0211	695.94	0.2289
318.58	0.0035	482.68	0.0255	702.18	0.2627
354.25	0.0049	487.15	0.0283	703.57	0.2788
374.46	0.0059	508.36	0.0376	703.58	0.3047
387.87	0.0068	538.21	0.0535		

Table 343. Test data for specimen 752–17

Test Number	: 035	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 353.1 MPa	Ultimate Stress	: 731.5 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
51.87	0.0000	415.15	0.0075	600.07	0.0693
92.12	0.0002	427.94	0.0085	617.69	0.0807
133.71	0.0006	438.10	0.0096	642.48	0.0970
169.18	0.0010	448.40	0.0107	662.79	0.1101
196.51	0.0013	456.96	0.0120	682.40	0.1292
206.15	0.0014	471.20	0.0143	696.62	0.1461
229.57	0.0016	479.11	0.0160	706.37	0.1602
241.54	0.0017	485.87	0.0177	715.42	0.1768
287.10	0.0025	490.84	0.0193	722.18	0.1928
311.74	0.0030	511.05	0.0257	726.45	0.2088
336.48	0.0038	531.56	0.0339	730.62	0.2269
366.47	0.0048	547.90	0.0411	731.50	0.2468
395.91	0.0062	578.07	0.0570		

Table 344. Test data for specimen 752-15

Test Number	: 142	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 405.3 MPa	Ultimate Stress	: 777.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
196.500	0.0023	476.870	0.0145	712.470	0.1307
234.030	0.0029	497.610	0.0192	736.930	0.1608
364.040	0.0064	542.590	0.0308	761.290	0.2061
416.570	0.0089	592.130	0.0526	774.830	0.2507
452.570	0.0120	636.250	0.0761	777.060	0.2910
		683.480	0.1051	777.060	0.3241

Table 345. Test data for specimen 752-22

Test Number	: 143	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 367.7 MPa	Ultimate Stress	: 749.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
48.437	0.0001	457.530	0.0062	673.900	0.0911
136.060	0.0010	476.050	0.0065	705.860	0.1202
170.050	0.0014	496.530	0.0081	726.020	0.1470
218.750	0.0022	527.000	0.0091	742.570	0.1859
218.750	0.0023	585.350	0.0315	748.660	0.2244
260.200	0.0025	634.610	0.0630	748.960	0.2250
				749.070	0.2516

Table 346. Test data for specimen 752-23

Test Number	: 231	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 338.9MPa	Ultimate Stress	: 726.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
22.240	0.0001	201.840	0.0011	407.290	0.0070
34.880	0.0002	214.420	0.0013	634.090	0.0772
51.080	0.0003	271.880	0.0020	646.910	0.0855
76.780	0.0004	291.410	0.0024	672.620	0.1043
88.920	0.0005	318.200	0.0031	682.600	0.1128
100.790	0.0005	334.380	0.0036	706.530	0.1391
112.790	0.0006	342.270	0.0039	708.140	0.1413
137.610	0.0007	349.800	0.0042	714.060	0.1505
150.940	0.0008	390.310	0.0060	722.490	0.1687
163.660	0.0009	396.200	0.0063	724.850	0.1775
176.280	0.0010	401.980	0.0067	725.730	0.1816

Table 347. Test data for specimen 75-109

Test Number	: 145	Test Temp.	: 25°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 359.0 MPa	Ultimate Stress	: 736.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
48.892	0.0012	472.220	0.0247	643.790	0.1140
199.300	0.0051	478.010	0.0261	676.920	0.1447
219.940	0.0054	489.830	0.0315	702.560	0.1779
348.950	0.0102	520.200	0.0433	719.440	0.2148
403.120	0.0139	551.920	0.0594	730.490	0.2542
428.950	0.0168	552.110	0.0591	736.790	0.2928
452.430	0.0204	600.380	0.0858	736.850	0.3318

Table 348. Test data for specimen 751–04

Test Number	: 030	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 311.7 MPa	Ultimate Stress	: 721.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
48.54	0.0000	408.53	0.0077	606.25	0.0714
90.43	0.0002	425.74	0.0089	630.29	0.0880
134.83	0.0005	443.64	0.0105	650.99	0.1013
179.28	0.0010	459.28	0.0123	666.13	0.1154
201.61	0.0014	473.69	0.0144	681.92	0.1326
218.76	0.0016	480.11	0.0155	695.37	0.1515
226.90	0.0017	489.23	0.0181	704.74	0.1687
262.63	0.0023	508.22	0.0229	712.42	0.1847
302.11	0.0032	537.36	0.0333	717.21	0.1999
341.04	0.0045	560.99	0.0451	720.61	0.2197
382.40	0.0063	582.85	0.0569	721.16	0.2289

Table 349. Test data for specimen 751–05

Test Number	: 031	Test Temp.	: 25°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 314.7 MPa	Ultimate Stress	: 746.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
69.62	0.0001	444.52	0.0099	618.84	0.0725
107.39	0.0003	461.24	0.0115	644.55	0.0900
147.01	0.0006	476.58	0.0133	665.59	0.1043
189.06	0.0012	485.24	0.0147	682.15	0.1204
205.23	0.0014	491.81	0.0160	707.31	0.1507
230.62	0.0017	505.54	0.0191	716.41	0.1659
253.21	0.0020	514.49	0.0214	728.36	0.1919
292.87	0.0027	525.23	0.0245	734.97	0.2082
338.76	0.0042	540.84	0.0298	739.68	0.2245
384.84	0.0059	560.52	0.0386	743.29	0.2445
393.36	0.0063	580.00	0.0488	745.32	0.2634
422.32	0.0080	598.87	0.0595	746.35	0.2819
433.57	0.0089				

Table 350. Test data for specimen 754–40

Test Number	: 054	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 196.8 MPa	Ultimate Stress	: 470.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.18	0.0000	232.42	0.0037	321.07	0.0442
89.11	0.0003	235.69	0.0040	341.04	0.0590
123.96	0.0006	238.81	0.0045	358.98	0.0725
145.21	0.0010	241.44	0.0049	378.49	0.0875
168.03	0.0015	244.76	0.0056	388.33	0.0953
181.49	0.0018	248.03	0.0065	401.73	0.1046
186.97	0.0020	251.20	0.0074	416.71	0.1194
191.35	0.0022	255.12	0.0087	431.07	0.1357
194.07	0.0024	259.39	0.0103	440.38	0.1474
200.63	0.0026	267.13	0.0130	450.70	0.1642
209.03	0.0028	271.85	0.0150	458.00	0.1774
214.22	0.0030	277.26	0.0177	463.66	0.1900
220.40	0.0032	282.13	0.0203	468.28	0.1987
226.04	0.0034	293.96	0.0268	469.36	0.2018
228.27	0.0035	308.43	0.0357	470.76	0.2125

Table 351. Test data for specimen 753–42

Test Number	: 050	Test Temp.	: 290°C
Aging Temp.	: Unaged	Aging Time	: –
Yield Stress	: 191.5 MPa	Ultimate Stress	: 474.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
44.3440	0.00	222.08	0.0034	398.27	0.1090
83.0220	0.0002	230.60	0.0039	406.65	0.1179
116.82	0.0005	236.84	0.0045	412.76	0.1236
134.36	0.0007	241.51	0.0055	417.75	0.1304
149.20	0.0009	246.82	0.0071	429.08	0.1449
157.04	0.0011	257.83	0.0110	435.04	0.1534
167.23	0.0013	267.57	0.0153	448.85	0.1758
175.47	0.0015	275.63	0.0197	457.06	0.1903
181.93	0.0017	285.57	0.0256	461.73	0.2050
188.24	0.0019	303.24	0.0371	464.70	0.2151
191.40	0.0021	323.45	0.0513	469.08	0.2283
195.44	0.0023	339.98	0.0633	473.01	0.2433
200.38	0.0026	353.00	0.0738	474.09	0.2465
208.54	0.0029	363.78	0.0821	472.18	0.2507
217.28	0.0032	375.41	0.0914	472.42	0.2565

Table 352. Test data for specimen 754–29

Test Number	: 252	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 193.3 MPa	Ultimate Stress	: 528.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
36.412	0.0002	179.423	0.0025	441.862	0.1347
41.148	0.0002	210.220	0.0040	451.291	0.1433
57.528	0.0002	249.736	0.0243	466.427	0.1593
70.250	0.0002	274.563	0.0351	468.035	0.1617
90.632	0.0004	300.745	0.0478	476.025	0.1705
100.911	0.0004	305.263	0.0503	489.641	0.1880
111.112	0.0005	337.575	0.0668	499.259	0.2017
121.536	0.0006	375.916	0.0883	505.088	0.2109
130.814	0.0007	379.132	0.0904	514.852	0.2408
148.456	0.0012	407.233	0.1086	521.458	0.2536
156.695	0.0013	421.315	0.1174	528.307	0.2792

Table 353. Test data for specimen 754–30

Test Number	: 248	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 202.6 MPa	Ultimate Stress	: 495.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
45.680	0.0003	223.970	0.0065	437.350	0.1377
51.210	0.0003	239.970	0.0109	457.490	0.1616
77.100	0.0003	246.020	0.0132	469.940	0.1789
87.660	0.0003	266.990	0.0223	470.880	0.1812
131.440	0.0005	288.840	0.0333	478.480	0.1979
159.370	0.0008	317.470	0.0486	480.510	0.2001
167.100	0.0011	354.290	0.0707	483.830	0.2023
186.600	0.0017	381.810	0.0883	489.030	0.2185
191.790	0.0020	394.310	0.0971	490.780	0.2207
211.650	0.0039	404.210	0.1068	494.300	0.2384
218.380	0.0050	425.420	0.1247	495.230	0.2454

Table 354. Test data for specimen 75–236

Test Number	: 253	Test Temp.	: 290°C
Aging Temp.	: 290°C	Aging Time	: 30,000 h
Yield Stress	: 211.8 MPa	Ultimate Stress	: 486.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
36.892	0.0002	255.878	0.0141	361.326	0.0738
37.892	0.0002	261.540	0.0166	382.851	0.0889
94.768	0.0006	289.771	0.0303	404.074	0.1067
105.428	0.0007	294.023	0.0325	421.601	0.1244
166.972	0.0018	298.105	0.0347	424.542	0.1268
175.525	0.0020	317.777	0.0457	437.309	0.1402
183.733	0.0023	321.576	0.0480	450.461	0.1679
217.030	0.0043	335.938	0.0567	454.177	0.1704
223.160	0.0052	339.600	0.0588	467.364	0.1903
228.276	0.0061	343.106	0.0609	477.248	0.2153
251.084	0.0121	359.107	0.0716	484.505	0.2478

Table 355. Test data for specimen 754–26

Test Number	: 095	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 205.6 MPa	Ultimate Stress	: 538.0 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
162.940	0.0011	288.440	0.0100	496.920	0.1370
170.480	0.0013	294.330	0.0114	499.300	0.1401
208.430	0.0024	323.730	0.0215	514.560	0.1594
213.960	0.0025	347.960	0.0328	519.350	0.1694
219.180	0.0026	366.250	0.0426	520.010	0.1712
225.250	0.0027	397.430	0.0605	524.370	0.1805
234.270	0.0028	411.880	0.0697	527.510	0.1911
265.920	0.0055	427.730	0.0796	531.100	0.1985
272.200	0.0065	431.270	0.0820	532.860	0.2008
278.730	0.0076	465.900	0.1042	533.870	0.2045
283.340	0.0087	482.360	0.1211	538.030	0.2252

Table 356. Test data for specimen 754–27

Test Number	: 096	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 10,000 h
Yield Stress	: 212.2 MPa	Ultimate Stress	: 534.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
177.540	0.0016	286.010	0.0088	424.200	0.0791
183.830	0.0018	321.270	0.0196	431.780	0.0848
188.850	0.0019	324.520	0.0210	444.420	0.0932
194.850	0.0021	337.700	0.0281	467.830	0.1091
200.550	0.0023	341.680	0.0300	471.420	0.1126
221.550	0.0027	356.970	0.0381	483.540	0.1269
226.910	0.0027	360.900	0.0402	492.980	0.1391
235.910	0.0029	364.890	0.0425	494.170	0.1410
245.150	0.0034	387.120	0.0555	502.840	0.1533
262.310	0.0047	409.150	0.0698	509.540	0.1658
266.490	0.0053	413.040	0.0723	521.010	0.1840

Table 357. Test data for specimen 752–40

Test Number	: 172	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 231.7 MPa	Ultimate Stress	: 589.3 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
93.421	0.0002	326.590	0.0128	475.750	0.0805
166.240	0.0010	339.400	0.0162	492.070	0.0906
213.040	0.0021	352.160	0.0199	516.690	0.1042
245.550	0.0034	361.640	0.0232	543.400	0.1291
265.980	0.0046	371.940	0.0271	559.930	0.1493
284.890	0.0060	390.000	0.0347	574.500	0.1689
300.400	0.0081	408.280	0.0434	583.160	0.1895
313.740	0.0102	420.580	0.0495	588.990	0.2076

Table 358. Test data for specimen 752–42

Test Number	: 171	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 268.5 MPa	Ultimate Stress	: 575.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
230.660	0.0030	369.990	0.0264	518.740	0.1080
265.350	0.0048	381.830	0.0310	532.150	0.1200
284.650	0.0062	404.550	0.0411	543.340	0.1316
297.110	0.0078	430.020	0.0540	552.940	0.1419
311.170	0.0098	459.230	0.0703	562.120	0.1553
322.820	0.0120	476.450	0.0810	569.480	0.1705
334.870	0.0150	494.220	0.0927	573.540	0.1820
348.320	0.0189	507.540	0.0988	575.810	0.1904

Table 359. Test data for specimen 75–246

Test Number	: 177	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 30,000 h
Yield Stress	: 213.0 MPa	Ultimate Stress	: 521.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
46.497	0.0000	258.800	0.0065	421.490	0.0760
77.711	0.0002	266.280	0.0075	427.680	0.0800
132.720	0.0009	285.060	0.0110	451.050	0.0965
155.130	0.0013	291.140	0.0126	460.800	0.1019
166.430	0.0015	313.720	0.0192	475.560	0.1176
189.580	0.0021	323.000	0.0225	479.520	0.1228
203.470	0.0027	337.710	0.0289	490.390	0.1379
212.740	0.0031	342.940	0.0302	495.670	0.1478
222.690	0.0036	377.670	0.0497	502.420	0.1582
229.870	0.0041	390.640	0.0570	511.320	0.1738
238.280	0.0046	402.720	0.0640	521.810	0.2189

Table 360. Test data for specimen 752–28

Test Number	: 328	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 258.9 MPa	Ultimate Stress	: 587.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
25.970	0.0001	298.060	0.0063	508.970	0.0947
30.490	0.0001	314.610	0.0087	517.340	0.1013
45.790	0.0002	321.370	0.0100	532.600	0.1145
69.930	0.0002	348.700	0.0166	539.410	0.1211
94.410	0.0002	354.740	0.0184	555.440	0.1387
106.620	0.0003	371.160	0.0239	560.630	0.1453
119.350	0.0003	408.340	0.0382	569.760	0.1585
152.680	0.0005	413.440	0.0405	571.100	0.1608
172.700	0.0006	458.240	0.0624	579.490	0.1762
181.970	0.0007	487.300	0.0796	582.490	0.1829
243.170	0.0023	490.590	0.0818	587.910	0.2074

Table 361. Test data for specimen 752–29

Test Number	: 329	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 264.1 MPa	Ultimate Stress	: 581.7 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
10.470	0.0001	198.390	0.0012	461.350	0.0630
15.080	0.0001	245.470	0.0025	486.660	0.0781
28.910	0.0002	264.430	0.0033	490.150	0.0803
40.310	0.0002	303.070	0.0064	517.200	0.0996
52.150	0.0002	314.860	0.0081	537.160	0.1170
86.080	0.0004	331.430	0.0111	543.650	0.1238
98.690	0.0005	359.010	0.0189	557.110	0.1391
123.080	0.0005	364.680	0.0209	562.080	0.1456
169.210	0.0008	402.960	0.0351	570.670	0.1588
179.540	0.0010	418.210	0.0416	574.430	0.1655
189.190	0.0011	449.620	0.0566	581.620	0.1876

Table 362. Test data for specimen 75–130

Test Number	: 327	Test Temp.	: 290°C
Aging Temp.	: 320°C	Aging Time	: 50,000 h
Yield Stress	: 239.6 MPa	Ultimate Stress	: 557.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
14.610	0.0001	250.740	0.0037	501.370	0.1157
15.780	0.0001	255.690	0.0041	508.070	0.1223
29.460	0.0002	277.600	0.0063	520.080	0.1354
63.210	0.0002	334.040	0.0190	525.390	0.1421
73.560	0.0002	339.410	0.0208	536.540	0.1575
107.350	0.0003	366.210	0.0312	540.710	0.1642
118.460	0.0005	390.590	0.0421	548.990	0.1796
167.810	0.0008	431.340	0.0637	551.730	0.1862
176.640	0.0010	455.150	0.0787	553.380	0.1906
200.580	0.0016	473.310	0.0918	556.490	0.2026
221.710	0.0023	484.180	0.1004	557.780	0.2119

Table 363. Test data for specimen 752–27

Test Number	: 049	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 2,570 h
Yield Stress	: 204.7 MPa	Ultimate Stress	: 528.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
64.52	0.0001	245.45	0.0031	396.80	0.0576
91.54	0.0002	249.86	0.0033	409.19	0.0657
122.15	0.0005	253.92	0.0035	423.78	0.0752
133.99	0.0006	257.98	0.0038	435.61	0.0833
145.78	0.0008	262.88	0.0042	443.82	0.0893
156.83	0.0010	269.37	0.0050	454.85	0.0971
164.93	0.0012	275.47	0.0058	464.08	0.1022
179.61	0.0015	279.51	0.0064	473.90	0.1108
183.09	0.0016	285.42	0.0074	484.10	0.1240
194.92	0.0019	289.31	0.0081	498.83	0.1407
198.02	0.0020	297.00	0.0098	506.89	0.1525
210.50	0.0022	341.65	0.0265	514.21	0.1641
217.85	0.0023	352.90	0.0323	520.25	0.1745
224.33	0.0024	363.57	0.0379	522.82	0.1817
232.13	0.0025	375.14	0.0446	527.72	0.1995
240.16	0.0028	387.46	0.0519	528.85	0.2102

Table 364. Test data for specimen 754–09

Test Number	: 086	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 219.8 MPa	Ultimate Stress	: 614.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
170.910	0.0014	279.750	0.0047	482.940	0.0737
185.290	0.0017	284.780	0.0050	532.470	0.1042
192.190	0.0020	289.860	0.0055	546.750	0.1160
201.790	0.0021	295.770	0.0060	560.960	0.1292
208.390	0.0022	317.070	0.0085	563.880	0.1318
213.970	0.0023	324.180	0.0097	574.620	0.1440
219.980	0.0024	360.220	0.0183	590.390	0.1657
256.250	0.0034	376.650	0.0229	597.080	0.1776
261.960	0.0037	395.680	0.0301	598.230	0.1805
267.730	0.0040	414.460	0.0377	605.840	0.1992
271.970	0.0042	443.340	0.0512	607.370	0.2014

Table 365. Test data for specimen 75–120

Test Number	: 087	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 10,000 h
Yield Stress	: 209.9 MPa	Ultimate Stress	: 595.6 MPa

Experimental Data Not Available.

Table 366. Test data for specimen 753–12

Test Number	: 260	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 264.4 MPa	Ultimate Stress	: 615.9 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
42.860	0.0002	242.480	0.0018	462.670	0.0549
46.130	0.0002	260.210	0.0026	477.470	0.0620
62.250	0.0002	265.620	0.0030	496.720	0.0730
73.840	0.0002	284.460	0.0040	511.520	0.0817
84.920	0.0002	292.560	0.0049	573.080	0.1317
96.220	0.0002	313.220	0.0069	587.290	0.1487
107.810	0.0002	342.890	0.0119	588.900	0.1509
155.230	0.0003	370.950	0.0193	599.960	0.1681
166.210	0.0004	387.840	0.0242	612.080	0.1955
176.320	0.0004	419.920	0.0358	615.790	0.2114
201.610	0.0007	445.240	0.0466		

Table 367. Test data for specimen 754–12

Test Number	: 247	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 227.2 MPa	Ultimate Stress	: 613.8 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
41.500	0.0002	240.490	0.0038	482.190	0.0713
48.630	0.0002	246.130	0.0041	533.550	0.1036
63.550	0.0002	261.530	0.0052	552.940	0.1191
73.690	0.0002	298.400	0.0089	560.220	0.1258
84.200	0.0003	315.180	0.0114	573.040	0.1390
94.900	0.0003	320.280	0.0122	578.930	0.1456
106.280	0.0004	339.060	0.0162	587.510	0.1566
117.700	0.0005	344.600	0.0174	592.150	0.1633
129.430	0.0006	436.660	0.0493	602.110	0.1809
158.620	0.0008	441.610	0.0513	609.860	0.2006
167.080	0.0011	478.120	0.0692	613.560	0.2163

Table 368. Test data for specimen 75–270

Test Number	: 234	Test Temp.	: 290°C
Aging Temp.	: 350°C	Aging Time	: 30,000 h
Yield Stress	: 209.0 MPa	Ultimate Stress	: 584.6 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
20.400	0.0001	178.270	0.0019	450.340	0.0725
25.300	0.0001	185.100	0.0021	472.740	0.0868
39.620	0.0002	210.620	0.0032	482.240	0.0933
51.040	0.0002	222.360	0.0038	496.940	0.1041
63.230	0.0003	243.480	0.0052	517.630	0.1218
74.150	0.0003	252.020	0.0060	520.020	0.1241
84.850	0.0003	291.630	0.0108	546.690	0.1528
95.840	0.0004	296.780	0.0117	553.470	0.1616
107.200	0.0005	303.530	0.0130	565.240	0.1790
118.220	0.0006	343.790	0.0238	579.400	0.2094
128.710	0.0007	431.440	0.0618	584.560	0.2344

Table 369. Test data for specimen 752-18

Test Number	: 045	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 2,570 h
Yield Stress	: 203.2 MPa	Ultimate Stress	: 591.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
53.16	0.0000	276.75	0.0050	472.83	0.0845
65.69	0.0001	290.82	0.0064	482.11	0.0904
83.84	0.0001	295.84	0.0071	486.77	0.0935
102.68	0.0003	303.20	0.0082	489.76	0.0966
129.64	0.0005	309.80	0.0094	509.96	0.1090
153.15	0.0009	316.91	0.0108	518.48	0.1156
167.42	0.0012	323.32	0.0121	536.20	0.1314
175.48	0.0013	335.40	0.0153	547.08	0.1430
188.90	0.0017	347.52	0.0193	556.17	0.1543
200.79	0.0020	361.98	0.0245	563.58	0.1645
205.86	0.0021	384.33	0.0342	572.07	0.1788
219.53	0.0024	403.70	0.0442	578.97	0.1907
230.76	0.0025	420.04	0.0531	584.98	0.2046
239.27	0.0027	434.94	0.0619	588.80	0.2162
249.21	0.0032	449.84	0.0707	591.03	0.2287
266.41	0.0042	460.81	0.0770	591.11	0.2332

Table 370. Test data for specimen 752–24

Test Number	: 080	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 208.2 MPa	Ultimate Stress	: 630.4 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
166.180	0.0012	317.100	0.0073	530.080	0.0940
183.810	0.0016	334.120	0.0091	549.340	0.1040
192.600	0.0019	341.430	0.0100	562.550	0.1153
201.000	0.0020	358.330	0.0129	582.320	0.1326
208.500	0.0022	396.480	0.0230	596.330	0.1469
241.190	0.0028	425.890	0.0341	599.780	0.1520
249.440	0.0031	453.060	0.0473	615.390	0.1766
265.540	0.0038	459.790	0.0509	617.680	0.1813
275.700	0.0042	482.880	0.0638	624.620	0.1961
300.580	0.0059	493.570	0.0721	625.760	0.2001
309.110	0.0066	509.940	0.0813	629.660	0.2153

Table 371. Test data for specimen 75–110

Test Number	: 081	Test Temp.	: 290°C
Aging Temp.	: 400°C	Aging Time	: 10,000 h
Yield Stress	: 206.7 MPa	Ultimate Stress	: 593.1 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
160.190	0.0011	325.060	0.0108	486.950	0.0865
173.030	0.0014	335.670	0.0127	493.300	0.0904
181.380	0.0016	342.500	0.0142	518.010	0.1059
188.460	0.0018	350.450	0.0162	546.780	0.1307
195.140	0.0021	371.710	0.0223	555.630	0.1416
203.200	0.0022	376.380	0.0247	567.390	0.1564
226.540	0.0026	398.020	0.0338	569.820	0.1600
255.540	0.0036	430.060	0.0497	581.550	0.1792
263.500	0.0042	435.800	0.0533	584.070	0.1832
290.530	0.0063	455.870	0.0646	589.730	0.1987
315.580	0.0093	469.890	0.0733	592.600	0.2091

Table 372. Test data for specimen 751-06

Test Number	: 044	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 218.7 MPa	Ultimate Stress	: 598.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
54.2050	0.0000	288.9000	0.0049	469.3600	0.0611
70.7470	0.0001	301.3900	0.0056	483.4600	0.0707
92.5100	0.0003	315.0200	0.0067	486.9300	0.0751
121.7500	0.0006	326.3300	0.0079	506.9400	0.0898
144.3000	0.0009	338.3800	0.0095	523.5300	0.1002
167.9700	0.0013	348.9000	0.0111	539.3900	0.1154
184.1700	0.0017	360.4500	0.0132	554.2400	0.1320
196.9200	0.0021	370.0800	0.0154	564.6300	0.1454
207.1000	0.0022	379.1700	0.0177	575.8300	0.1627
213.9400	0.0023	389.4300	0.0208	583.6300	0.1782
223.4400	0.0024	401.6600	0.0252	589.8600	0.1940
232.1500	0.0025	421.1800	0.0336	593.0000	0.2000
241.6500	0.0028	434.8200	0.0404	593.9100	0.2096
256.4200	0.0033	441.9700	0.0442	597.6300	0.2170
274.6700	0.0041	459.1300	0.0546	598.2000	0.2181

Table 373. Test data for specimen 752–09

Test Number	: 055	Test Temp.	: 290°C
Aging Temp.	: 450°C	Aging Time	: 2,570 h
Yield Stress	: 197.7 MPa	Ultimate Stress	: 606.2 MPa

Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain	Engr. Stress (MPa)	Engr. Strain
44.59	0.0000	243.86	0.0035	424.61	0.0403
90.76	0.0003	254.69	0.0039	438.26	0.0469
125.06	0.0006	264.50	0.0045	449.64	0.0527
147.87	0.0010	274.50	0.0052	463.48	0.0601
158.56	0.0012	291.16	0.0066	479.09	0.0689
170.34	0.0015	304.61	0.0079	487.00	0.0750
182.85	0.0018	318.99	0.0097	509.92	0.0899
185.86	0.0020	325.79	0.0106	526.84	0.0996
193.94	0.0022	330.57	0.0113	541.79	0.1111
198.67	0.0024	345.20	0.0142	559.48	0.1283
200.89	0.0025	353.23	0.0159	573.14	0.1451
209.16	0.0027	361.90	0.0180	582.87	0.1590
217.74	0.0028	379.79	0.0232	598.18	0.1875
233.70	0.0030	398.26	0.0293	603.47	0.2025
237.55	0.0032	411.17	0.0344	606.18	0.2268

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11. ABSTRACT (200 words or less)
The effect of thermal aging on tensile properties of cast stainless steels during service in light water reactors has been evaluated. Tensile data for several experimental and commercial heats of cast stainless steels are presented. Thermal aging increases the tensile strength of these steels. The high–C Mo–bearing CF–8M steels are more susceptible to thermal aging than the Mo–free CF–3 or CF–8 steels. A procedure and correlations are presented for predicting the change in tensile flow and yield stresses and engineering stress–vs.–strain curve of cast stainless steel as a function of time and temperature of service. The tensile properties of aged cast stainless steel are estimated from known material information, i.e., chemical composition and the initial tensile strength of the steel. The correlations described in this report may be used for assessing thermal embrittlement of cast stainless steel components.

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