U. S. Department of Commerce
John T. Connor, Secretary
National Bureau of Standards
A. V. Astin, Director

Certificate of Analysis

Standard Reference Material 1152

18 Cr-10 Ni Steel

ANALYST	C	Mn	P	S	Si	Cu	Ni	Cr	V	Mo
	Direct combustion	Persulfate-arsenite	Molybdenum-blue photometric	Combustion-iodate titration	Perchloric acid dehydration		Weighed as nickel dimethylglyoxime			Photometric
1	0.159	[a, b]1.17	0.018	[c]0.015	[d]0.654	[e]0.500	10.23	[f]18.44	[g]0.044	0.366
2	.162	[h]1.20	[i].018	.018	[d].655	[j].501	10.24	[f]18.51	[k].042	[l].362
3	.165	[m]1.18	[i].015	.016	[d].650	[n].502	[o]10.18	[p]18.47	[q].043	.374
4	.164	1.22	.014	.020	.663	.489	10.18	18.53	.044	.364
5	.165	[m]1.18	.018	.016	[r, d].646	[s].495 [j].496	10.24	[t]18.52	[u].045	[v].363
Average	0.163	1.19	0.017	0.017	0.654	0.497	10.21	18.49	0.044	0.366

[a] Chromium removed by precipitation with $NaHCO_3$.
[b] Potentiometric titration.
[c] 1-g sample burned in oxygen at 1450 °C and sulfur dioxide absorbed in starch-iodide solution. Iodine is liberated to iodide by titration, during the combustion, with standard KIO_3 solution. Titer is based on 93 percent of the theoretical factor.
[d] Double dehydration with intervening filtration.
[e] Diethyldithiocarbamate photometric method. See J. Res. NBS 47, 380 (1951) RP2265.
[f] Persulfate oxidation, potentiometric titration with ferrous ammonium sulfate.
[g] Nitric acid oxidation, potentiometric titration with ferrous ammonium sulfate.
[h] Chromium volatilized as CrO_2Cl_2.
[i] Alkali-molybdate method.
[j] H_2S-electrolytic method.
[k] Ether-cupferron-$FeSO_4$-$(NH_4)_2S_2O_8$-$KMnO_4$.
[l] H_2S-alpha benzoinoxime-MoO_3 method.
[m] Periodate photometric method.
[n] Copper precipitated with thiocyanate and titrated with cyanide.
[o] Dimethylglyoxime precipitate titrated with cyanide.
[p] Persulfate oxidation, titration with $FeSO_4$-$KMnO_4$.
[q] $FeSO_4$-$(NH_4)_2S_2O_8$-$KMnO_4$.
[r] Sulfuric acid dehydration.
[s] 2,2′ biquinoline photometric method.
[t] Persulfate oxidation, titration with $FeSO_4$-$K_2Cr_2O_7$.
[u] Nitric acid oxidation, titration with $FeSO_4$-$K_2Cr_2O_7$.
[v] Alpha benzoinoxime gravimetric method.

List of Analysts

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SIZE: Samples are disks, 1¼ in. in diameter and ¾ in. thick.

PREPARATION AND TESTING: The material for this standard was melted under an argon cover in a 1000-lb induction furnace in the NBS Foundry, and then cast into a single ingot. The ingot was processed by the Naval Weapons Plant by forging to a slab having one dimension of the cross section four times that of the other dimension. After cropping top and bottom, 15 and 5 percent respectively, the slab was cut lengthwise and the center section corresponding to one-fourth of the original ingot was discarded. The two slab portions were hot rolled to oversize rods and, after annealing, were centerless ground to size.

The homogeneity of the material was established at the National Bureau of Standards and General Motors Corporation by metallographic studies, by optical emission and x-ray spectrochemical analysis, and by chemical analysis.

Samples for chemical analysis were prepared in the form of millings cut from the cross section of the finished samples.

SHINGTON, D. C.
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(Over)

W. Wayne Meinke, Chief
Office of Standard Reference Materials

Supplemental Information

Other Elements: In addition to the certified elements, the following are present at the approximate concentrations listed:

Ti	Nb	Ta	Al	Zr	Co	Sn	Pb	As	B
0.12[a]	0.20[b]	0.08_5[c]	0.00_2[d]	0.03[e]	0.09_5[f]	0.00_4[g]	0.00_1[h]	0.0_1[i]	0.005[i]

[a] Ion-exchange. H_2O_2 photometric method at NBS.
[b] Ion-exchange. Hydroquinone photometric method at NBS.
[c] Average of spectrographic method at American Cast Iron Pipe Co., and ion-exchange-pyrogallic acid photometric method at NBS.
[d] Polarographic method at NBS.
[e] Ion-exchange. H_2O_2-phosphate gravimetric method.
[f] Average of photometric methods at General Motors Corp. and NBS; and spectrographic method at NBS.
[g] Average of sulfide-iodate volumetric method at General Motors Corp., and spectrographic and polarographic methods at NBS.
[h] Average of spectrographic method at General Motors Corp., and polarographic method at NBS.
[i] Average of photometric methods at General Motors Corp. and NBS; and spectrographic method at NBS.