

## Certificate

### Standard Reference Material 391 Acrylonitrile-Butadiene Rubber

Standard Reference Material 391 has the following characteristics when tested by procedures described in the overleaf. The uncertainty limits for the values reflect both variation within the lot of rubber and error of test, and are based on a confidence coefficient of 95%. The Mooney viscosity of the rubber is  $49.0 \pm 1.0$  ML 1+4 (100 °C). The stability of the Mooney viscosity during storage is not known.

<u>Characteristic of Compound</u>	<u>Unit</u>	<u>Value</u>
<u>Viscometer Cure at 150 °C</u>		
Minimum viscosity	ML	27.5 ± 0.5
Incipient cure, $t_5$	min	8.53 ± 0.04
Cure index, $\Delta t$	min	1.28 ± 0.03
<u>Stress at 300% Elongation</u>		
Cure, 15 min at 150 °C	lb/in <sup>2</sup>	630 ± 20
30 min at 150 °C	lb/in <sup>2</sup>	910 ± 20
60 min at 150 °C	lb/in <sup>2</sup>	1040 ± 20
<u>Stress at Failure</u>		
Cure, 15 min at 150 °C	lb/in <sup>2</sup>	2650 ± 100
30 min at 150 °C	lb/in <sup>2</sup>	2760 ± 100
60 min at 150 °C	lb/in <sup>2</sup>	2700 ± 100
<u>Elongation at Failure</u>		
Cure, 15 min at 150 °C	%	810 ± 20
30 min at 150 °C	%	665 ± 20
60 min at 150 °C	%	590 ± 20
<u>Strain at 400 lb/in<sup>2</sup></u>		
Cure, 15 min at 150 °C	%	250 ± 2
30 min at 150 °C	%	189 ± 2
60 min at 150 °C	%	172 ± 2
<u>Resistivity</u>		
Cure, 60 min at 150 °C	megohm-cm	21 ± 1

This lot of rubber was evaluated in the National Bureau of Standards Institute for Materials Research by G. W. Bullman and A. M. Brown of the Evaluation Criteria Section, G. E. Decker, Chief.

Washington, D. C. 20234  
February 14, 1969  
(Revised September 15, 1972)

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**MATERIAL:** Standard Reference Material 391 was selected from a lot of acrylonitrile-butadiene rubber containing approximately 33% combined acrylonitrile, and was prepared from a single tank of blended latex. The dried rubber was wrapped in polyethylene film, and packaged in multiwall paper bags containing 25 kilograms. For evaluation of the lot, samples of approximately 2 kilograms were taken after each tenth package.

**TESTS:** Two determinations of Mooney viscosity were made on each portion according to the procedure described in ASTM Designation D 1646-68 using integral dies in the viscometer and an O-ring seal between rotor stem and die as described in NBS Report 9948.

Forty compounds were prepared from 10 parts of the lot in accordance with the formulation and mixing procedure described in ASTM D 15-66T for Standard Formula 1F. The black was dried for one hour at 100 °C before weighing and the mixing was done in a room conditioned at  $23 \pm 1$  °C and  $35 \pm 3\%$  relative humidity. The following NBS Standard Reference Materials were used to prepare the compounds: Zinc Oxide 370c, Sulfur 371c, Stearic Acid 372g, Benzothiazyl Disulfide 373c, and Gas Furnace Black 382a.

The viscometer cure characteristics of each compound were determined at 150 °C according to ASTM Designation D 1646-68, selecting for the cure index the time required to increase from 5 to 35 points above the minimum. The remaining compound was vulcanized as described in ASTM Designation D 15-66T using a four-cavity mold machined directly in the hot plates of the press.

Stress at 300% elongation, stress at failure and elongation at failure was measured on each vulcanizate in accordance with ASTM D 412-68. Strain was measured as described in ASTM Designation D 1456-61 using a stress of 400 pounds per square inch. Electrical resistivity was measured as described in Ind. Eng. Chem. 44, 159 (1952).

Swelling was determined in accordance with ASTM Designation D 471-66 using Reference Fuel B (a carefully proportioned mixture of 70 volumes of Eastman 2,2,4-trimethylpentane and 30 volumes of ACS Reagent-grade toluene). The period of immersion was  $70 \pm 0.1$  hour.