



National Institute of Standards & Technology

Certificate

Standard Reference Material 386k

Styrene Butadiene Rubber

Type 1500

This Standard Reference Material (SRM) was selected from the central portion of a carefully prepared lot of Styrene Butadiene Rubber 1500. SRM 386k has the characteristics listed below when prepared as a compound and tested by procedures described in the appendix. The uncertainty limits of the certified values reflect both variation within this lot of rubber and error of the test. They represent one standard deviation about the mean value.

Characteristics	Value (Conventional Units)	Value (SI Units)
Viscometer cure at 150 °C		
Incipient Cure, t_5	7.74 ± 0.5 min	464 ± 30 seconds
Cure Index	3.01 ± 0.37 min	181 ± 22.3 seconds
Stress at 300% Elongation		
Cure: 25 min at 145 °C	1124 ± 98 lb/in ²	7.75 ± 0.68 MPa
35 min at 145 °C	2192 ± 136 lb/in ²	15.11 ± 0.94 MPa
50 min at 145 °C	2749 ± 174 lb/in ²	18.95 ± 1.20 MPa
Stress at Failure		
Cure: 25 min at 145 °C	3040 ± 182 lb/in ²	20.96 ± 1.25 MPa
35 min at 145 °C	3729 ± 326 lb/in ²	25.71 ± 2.25 MPa
50 min at 145 °C	3657 ± 398 lb/in ²	25.21 ± 2.74 MPa
Elongation at Failure		
Cure: 25 min at 145 °C	615 ± 43.5%	---
35 min at 145 °C	449 ± 49%	---
50 min at 145 °C	370 ± 44.1%	---
Oscillating Disk Curemeter at 160 °C		
Minimum Torque, M_L	8.0 ± 0.4 lb-in	0.90 ± 0.05 N·m
Maximum Torque, M_H	41.4 ± 0.8 lb-in	4.68 ± 0.09 N·m
Scorch Time		
t_{s1}	4.1 ± 0.5 min	246 ± 30 seconds
t'_{50} Cure Time (50%)	9.7 ± 0.4 min	582 ± 24 seconds
t'_{90} Cure Time (90%)	16.2 ± 1.1 min	972 ± 66 seconds

This lot of rubber was evaluated in the NIST Polymers Division, by K.M. Flynn and G.B. McKenna.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.C. Colbert.

Gaithersburg, MD 20899
October 5, 1992
(Revision of certificated dated 1-11-90)

William P. Reed, Chief
Standard Reference Materials Program

(over)

APPENDIX TO CERTIFICATE FOR
STANDARD REFERENCE MATERIAL 386k

Material: SRM 386k was blended, dried, and compressed into bales weighing approximately 34 kg, wrapped in polyethylene, and packaged in multiwall paper bags. A portion for evaluation and testing was taken from every 25th bale as the lot was produced.

Test Procedure: Rubber compounding SRMs were mixed with each test sample to form compounds according to the formulation and mixing procedure described in ASTM Designation D 3185-88 for Standard Formula 1A. The rubber compounding SRMs used were: 370e, Zinc Oxide; 371h, Sulfur; 372i, Stearic Acid; 384d, N-tertiary-butyl-2-benzothiazylsulfenamide; and 378b, Oil Furnace Black. SRM 378b was dried for one hour at 125 °C before weighing. The room conditions during mixing of the four compounds were 23 ± 2 °C and 35 ± 5 percent relative humidity.

After mixing and before testing, all of the compounds were stored in a desiccator containing calcium chloride. The viscometer cure characteristics were determined on portions of each compound at 150 °C according to ASTM Designation D 1646-90 using the large rotor. The cure index was selected as the time required to increase from 5 to 35 points above the minimum. The vulcanization characteristics were determined with an oscillating disk curemeter at 160 °C according to ASTM Designation D 2084-91.

The remaining portions of each compound were remilled, and vulcanized at 145 °C, as described in ASTM Designation D 3182-89 using a four-cavity mold machined directly in the hot plates of the press. After remilling and before curing, the compound was stored in a desiccator containing calcium chloride. The periods of vulcanization were 25, 35 and 50 minutes. Stress at 300 percent elongation, stress at failure, and elongation at failure were measured as described in ASTM Designation D 412-87 using Die C.