## Butadiene-Styrene 75/25 Rubber

CAS: 9003-55-8

### DESCRIPTION

Butadiene-Styrene 75/25 Rubber is available as a liquid latex or solid rubber that is produced by the emulsion polymerization of butadiene and styrene, using fatty acid soaps as emulsifiers, a persulfate catalyst, a suitable molecular weight regulator (if required), and a suitable shortstop. It is also available as a solid rubber produced by the solution-copolymerization of butadiene and styrene in a hexane solution, using butyl lithium as a catalyst.

The latex has a pH of 9.5 to 11.0 and a solids content of 26% to 42%. It is coagulated with or without other food-grade ingredients in a heated kettle. The coagulated mass is squeezed to drain off serums, then the coagulum is washed with hot water (with or without alkali), and it is rinsed with water until the batch is neutral. Finally, the coagulum is dried to remove residual volatiles. When butadiene-styrene rubber is purchased in the latex form, it must be washed by the preceding or an equivalent procedure.

In the case of the solvent-polymerized product, solvent and volatiles are removed by processing with hot water or by drum-drying. Both of the solid forms are supplied by the manufacturer either in slab form or as a uniform, free-flowing crumb and may contain a suitable food-grade antioxidant. The crumb form, in addition, may contain a suitable food-grade partitioning agent.

**Functional Use in Foods** Masticatory substance in chewing gum base.

### REQUIREMENTS

**Note**: The following **REQUIREMENTS** apply to the solid rubber as supplied by the manufacturer, or to the washed and dried coagulum obtained from the latex as described above.

**Identification** Identify emulsion-polymerized Butadiene-Styrene 75/25 Rubber latex and solid by comparing their infrared absorption spectra with the respective typical spectra as shown in the section on *Infrared Spectra* (*Series C: Other Substances*). Prepare latex samples by first drying at 105° for 4 h, then by dissolving in hot toluene and evaporating on a potassium bromide plate. Prepare solid samples by dissolving them in hot toluene and evaporating on a potassium bromide plate.

**Arsenic** (as As) Not more than 3 mg/kg.

**Bound Styrene** Between 22.0% and 26.0%.

**Heavy Metals** (as Pb) Not more than 10 mg/kg.

**Lead** Not more than 3 mg/kg.

**Lithium** Not more than 0.0075%.

**Quinones** Not more than 0.002%.

**Residual Hexane** Not more than 0.01%.

**Residual Styrene** Not more than 0.002%.

## TESTS

**Arsenic** Prepare a *Sample Solution* as directed in the general method under *Chewing Gum Base*, Appendix IV. This solution meets the requirements of the *Arsenic Test*, Appendix IIIB.

**Bound Styrene** Determine as directed in the general method, Appendix IV.

**Heavy Metals** Prepare and test a 2-g sample as directed in *Method II* under the *Heavy Metals Test*, Appendix IIIB, using 20 µg of lead ion (Pb) in the control (*Solution A*).

**Lead** Prepare a *Sample Solution* as directed in the general method under *Chewing Gum Base*, Appendix IV. This solution meets the requirements of the *Lead Limit Test*, Appendix IIIB, using 10 µg of lead ion (Pb) in the control.

**Lithium**

*Atomic Absorption Spectrophotometer* Use a suitable instrument, equipped with a lithium hollow cathode lamp, capable of measuring the radiation absorbed by lithium in the 6707-nm spectral band.

*Standard Solution* Transfer 399.3 mg of ACS reagent-grade lithium carbonate to a 1000-mL volumetric flask, dissolve in a minimum amount of 1:1 hydrochloric acid–water, dilute to volume with water, and mix. Transfer 10.0 mL of this solution to a 100-mL volumetric flask, dilute to volume with water, and mix. Finally, transfer 10.0 mL of this solution to a second 100-mL volumetric flask, add 1.0 mL of hydrochloric acid, dilute to volume with water, and mix. This solution contains 75 µg of Li per 100 mL. *Sample Solution* Weigh accurately 1 g of a solid rubber sample, wrap it tightly in ashless filter paper, and place in a tared platinum crucible. Heat in an oven at 100° for 15 min, and then transfer to a muffle furnace programmed to reach 500° within 1 to 3 h after introduction of the sample. Remove the crucible from the furnace 15 to 20 min after 500° has been reached, and cool in a desiccator. Quantitatively transfer the contents of the crucible to a 100-mL volumetric flask, using 1 mL of hydrochloric acid and water, dilute to volume with water, and mix.

*Procedure* Following the manufacturer's instructions for operating the atomic absorption spectrophotometer, aspirate a suitable portion of the *Standard Solution* through the flame. In a similar manner, aspirate a suitable portion of the *Sample Solution*. Any absorbance produced by the *Sample Solution* does not exceed that produced by the *Standard Solution*.

**Quinones** Determine as directed in the general method, Appendix IV.

**Residual Hexane** (**Note**: The isooctane, 2,2,4-trimethylpentane, used in this test should be of chromatographic-grade quality.)

*Internal Standard Stock Solution* Transfer 150 mg of *n*-nonane, accurately weighed, to a 50-mL volumetric flask, dilute to volume with isooctane, and mix.

*Dilute Internal Standard Solution* Pipet 10.0 mL of *Internal Standard Stock Solution* into a 100-mL volumetric flask, dilute to volume with isooctane, and mix. Pipet 5.0 mL of this solution into a 250-mL volumetric flask, dilute to volume with isooctane, and mix. Each mL of the final solution contains 6 µg of *n*-nonane.

*Hexane Standard Solution* Transfer 150 mg of *n*-hexane, accurately weighed, to a 50-mL volumetric flask, dilute to vol-

ume with isooctane, and mix. Pipet 1.0 mL of this solution into a 100-mL volumetric flask, dilute to volume with isooctane, and mix. Finally, pipet 10.0 mL of this solution and 10.0 mL of *Internal Standard Stock Solution* into a 50-mL volumetric flask, dilute to volume with isooctane, and mix.

*Sample Preparation* Weigh accurately 1.5 g of a solid rubber sample, transfer it into a 4-oz bottle, and pipet 25.0 mL of the *Dilute Internal Standard Solution* into the bottle. Stopper the bottle, and shake mechanically overnight to dissolve the rubber. Add 50 mL of methanol to precipitate out the polymer, and shake vigorously for 15 min. Allow the mixture to settle, and decant the liquid phase into a 250-mL separator. Wash the polymer with 25 mL of methanol, and add the wash to the separator. Add 50 to 75 mL of cold water to the separator, and shake vigorously for 1 min, venting periodically to release any pressure. Allow the phases to separate, drain off the bottom (aqueous) phase, and rewash the isooctane phase with a second 50-mL portion of cold water. Shake again, allow to separate, and drain off the bottom layer. Transfer 10 mL of the isooctane phase to a 20-mL vial for the analysis.

*Procedure* Use a gas chromatograph equipped with a flame-ionization detector and a column capable of separating hexane, isooctane, and *n*-nonane. Under typical conditions, the instrument contains a 3-m × 3-mm stainless steel column packed with 60- to 80-mesh Chromosorb P containing 15% didecyl phthalate. The column is maintained isothermally at 120°, the injection port at 240°, and the detector at 250°. Helium is the carrier gas, flowing at a rate of 30 mL/min. A digital integrator or computer is recommended for data acquisition, although any mode (other than triangulation and planimetry) that gives accurate and reliable measurement of the peak areas is satisfactory.

Chromatograph duplicate 5-µL portions of the *Hexane Standard Solution*, and measure the areas under the hexane and nonane peaks. In a similar manner, chromatograph duplicate 5-µL portions of the *Sample Preparation*, and measure the areas under the hexane and nonane peaks. The peak area ratio of hexane to nonane (i.e., hexane divided by nonane) produced by the *Sample Preparation* does not exceed that produced by the *Hexane Standard Solution*.

**Residual Styrene** Determine as directed in the general method, Appendix IV.

**Packaging and Storage** Store in well-closed containers.