§ 177.1640 Polystyrene and rubber-modified polystyrene.

Polystyrene and rubber-modified polystyrene identified in this section may be safely used as components of articles intended for use in contact with food, subject to the provisions of this section.

(a) *Identity.* For the purposes of this section, polystyrene and rubber-modified polystyrene are basic polymers manufactured as described in this paragraph so as to meet the specifications prescribed in paragraph (c) of this section when tested by the method described in paragraph (d) of this section.

(1) Polystyrene consists of basic polymers produced by the polymerization of styrene.

(2) Rubber-modified polystyrene consists of basic polymers produced by combining styrene-butadiene copolymers and/or polybutadiene with polystyrene, either during or after polymerization of the polystyrene, such that the finished basic polymers contain not less than 75 weight percent of total polymer units derived from styrene monomer.

(b) *Optional adjuvants.* The basic polymers identified in paragraph (a) of this section may contain optional adjuvant substances required in the production of such basic polymers. Such optional adjuvant substances may include substances permitted for such use by regulations in parts 170 through 189 of this chapter, substances generally recognized as safe in food, and substances used in accordance with a prior sanction or approval.

(c) *Specifications.* (1) Polystyrene basic polymers identified in paragraph (a)(1) of this section shall contain not more than 1 weight percent of total residual styrene monomer, as determined by the method described in paragraph (d) of this section, except that when used in contact with fatty foods of Types III, IV-A, V, VII-A, and IX described in table 1 of § 176.170(c) of this chapter, such polystyrene basic polymers shall contain not more than 0.5 weight percent of total residual styrene monomer.

(2) Rubber-modified polystyrene basic polymers identified in paragraph (a)(2) of this section shall contain not more than 0.5 weight percent of total residual styrene monomer, as determined by the method described in paragraph (d) of this section.

(d) *Analytical method for determination of total residual styrene monomer content*—(1) *Scope.* This method is suitable for the determination of residual styrene monomer in all types of styrene polymers.

(2) *Principle.* The sample is dissolved in methylene chloride. An aliquot of the solution is injected into a gas chromatograph. The amount of styrene monomer present is determined from the area of the resulting peak.

(3) *Apparatus*—(i) *Gas chromatograph.* Beckman GC-2A gas chromatograph with hydrogen flame detector or apparatus of equivalent sensitivity.

(ii) *Chromatograph column.* One-quarter inch outside diameter stainless steel tubing (0.028 inch wall thickness), 4 feet in length, packed with 20 percent polyethylene glycol (20,000 molecular weight) on alkaline treated 60–80 mesh firebrick.

(iii) *Recorder.* Millivolt range of 0–1, chart speed of 30 inches per hour.

(4) *Reagents.* Compressed air, purified; helium gas; hydrogen gas; methylene chloride, redistilled; and styrene monomer, redistilled.

(5) *Operating conditions for the gas chromatograph.* (i) The column is operated at a temperature of 100 °C with a helium flow rate of 82 milliliters per minute.

(ii) The hydrogen burner is operated with 15 pounds per square inch of air pressure and 7 pounds per square inch of hydrogen pressure.

(iii) The attenuation of the hydrogen flame detector is set at 2×10^2.

(6) *Standardization.* (i) Prepare a standard solution by weighing accurately 15 to 20 milligrams of styrene monomer into a 2-ounce bottle containing 25.0 milliliters of methylene chloride. Cap the bottle tightly and shake to thoroughly mix the solution.

(ii) By means of a microliter syringe, inject 1 microliter of the standard solution into the gas chromatograph. Measure the area of the styrene monomer peak which emerges after approximately 12 minutes.

(7) *Procedure.* (i) Transfer 1 gram of sample (accurately weighed to the nearest 0.001 gram to a 2-ounce bottle

and add several glass beads. Pipette 25.0 milliliters of methylene chloride into the bottle. Cap the bottle tightly and place on a mechanical shaker. Shake until the polymer is completely dissolved. If any insoluble residue remains, allow the bottle to stand (or centrifuge at a low speed) until a clear supernatant layer appears.

(ii) By means of a microliter syringe, inject 3 microliters of the clear supernatant liquid into the gas chromatograph.

(iii) Measure the area of the resulting styrene monomer peak. Compare the sample peak area with the area produced by the standard styrene monomer solution. Calculation:

Percent residual styrene monomer=Milligrams monomer in standard×peak area of sample/Peak area of monomer standard×sample weight in grams×30

(e) *Other specifications and limitations.* The polystyrene and rubber-modified polystyrene identified in and complying with this section, when used as components of the food-contact surface of any article that is the subject of a regulation in parts 174, 175, 176, 177, 178 and §179.45 of this chapter, shall comply with any specifications and limitations prescribed by such regulation for the article in the finished form in which it is to contact food.

(f) *Nonapplicability*. The provisions of this section are not applicable to polystyrene and rubber-modified polystyrene used in food-packaging adhesives complying with §175.105 of this chapter.

§177.1650 Polysulfide polymer-polyepoxy resins.

Polysulfide polymer-polyepoxy resins may be safely used as the food-contact surface of articles intended for packaging, transporting, holding, or otherwise contacting dry food, in accordance with the following prescribed conditions:

(a) Polysulfide polymer-polyepoxy resins are the reaction products of liquid polysulfide polymers and polyfunctional epoxide resins, cured with the aid of tri(dimethylaminomethyl) phenol, to which have been added certain optional substances to impart desired technological properties to the resins. Subject to any limitations prescribed in this section, the optional substances may include:

(1) Substances generally recognized as safe in food and food packaging.

(2) Substances the use of which is permitted under applicable regulations in this part, prior sanctions, or approvals.

(3) Substances named in this subparagraph and further identified as required:

List of substances	Limitations
Bis(2-chloroethyl) formal.	
Bis(dichloropropyl) formal	Cross-linking agent.
Butyl alcohol	Solvent.
Carbon black (channel process).	
Chlorinated paraffins	Cross-linking agent.
Epoxidized linseed oil.	
Epoxidized soybean oil.	
Epoxy resins (as listed in §175.300(b)(3)(viii)(*a*) of this chapter)..	
Ethylene glycol monobutyl ether	Solvent.
Magnesium chloride.	
Methyl isobutyl ketone	Solvent.
Naphthalene sulfonic acid-formaldehyde condensate, sodium salt.	
Sodium dibutyl naphthalene sulfonate	Wetting agent.
Sodium hydrosulfide.	
Sodium polysulfide.	
β,β′,γ,γ′-Tetrachloro normal propyl ether.	Cross-linking agent.
Titanium dioxide.	
Toluene	Solvent.
Trichloroethane	Cross-linking agent.
1,2,3-Trichloropropane	Do.
Urea-formaldehyde resins.	
Xylene	Solvent.

(b) The resins are used as the food-contact surface for dry food.

(c) An appropriate sample of the finished resin in the form in which it contacts food, when subjected to ASTM method D968–81, ''Standard Test Methods for Abrasion Resistance of Organic Coatings by the Falling Abrasive Tester,'' which is incorporated by reference (copies may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia, PA 19103, or may be examined at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC 20408), using No. 50 Emery abrasive in lieu of Ottawa sand, shall exhibit and abrasion coefficient of not less than 20 liters per mil of film thickness.

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