

(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  $2 \times 10^2$ .

(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:

$$\text{Percent residual styrene monomer} = \frac{\text{Milligrams monomer in standard} \times \text{peak area of sample}}{\text{Peak area of monomer standard} \times \text{sample weight in grams}} \times 30$$

(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.	Cross-linking agent.
Bis(dichloropropyl) formal .....	
Butyl alcohol .....	Solvent.
Carbon black (channel process).	Cross-linking agent.
Chlorinated paraffins .....	
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.	Solvent.
Methyl isobutyl ketone .....	
Naphthalene sulfonic acid-formaldehyde condensate, sodium salt.	

§ 177.1655

21 CFR Ch. I (4-1-07 Edition)

List of substances	Limitations
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, 100 Barr Harbor Dr., West Conshohocken, Philadelphia, PA 19428-2959, or may be examined at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html)), using No. 50 Emery abrasive in lieu of Ottawa sand, shall exhibit an abrasion coefficient of not less than 20 liters per mil of film thickness.

[42 FR 14572, Mar. 15, 1977, as amended at 49 FR 10110, Mar. 19, 1984]

§ 177.1655 Polysulfone resins.

Polysulfone resins identified in paragraph (a) of this section may be safely used as articles or components of articles intended for use in contact with food, in accordance with the following prescribed conditions:

(a) For the purpose of this section, polysulfone resins are:

(1) Poly(oxy-*p*-phenylenesulfonyl-*p*-phenyleneoxy-*p*-phenyleneisopropylidene-*p*-phenylene) resins (CAS Reg. No. 25154-01-2) consisting of basic resins produced when the disodium salt of 4,4'-isopropylidenediphenol is made to react with 4,4'-dichlorodiphenyl sulfone in such a way that the finished resins have a minimum number average mo-

lecular weight of 15,000, as determined by osmotic pressure in monochlorobenzene; or

(2) 1,1'-Sulfonylbis[4-chlorobenzene] polymer with 4,4'-(1-methylethylidene)bis[phenol] (minimum 92 percent) and 4,4'-sulfonylbis[phenol] (maximum 8 percent) (CAS Reg. No. 88285-91-0) produced when a mixture of 4,4'-isopropylidenediphenol (minimum 92 percent) and 4,4'-sulfonylbis[phenol] (maximum 8 percent) is made to react with 4,4'-dichlorodiphenyl sulfone in such a way that the finished resin has a minimum number average molecular weight of 26,000, as determined by osmotic pressure in dimethylformamide.

(b) The basic polysulfone resins identified in paragraph (a) of this section may contain optional adjuvant substances required in the production of such basic resins. The optional adjuvant substances required in the production of the basic polysulfone resins may include substances described in § 174.5(d) of this chapter and the following:

List of substances	Limitations
Dimethyl sulfoxide .....	Not to exceed 50 parts per million as residual solvent in finished basic resin in paragraph (a)(1) of this section.
Monochlorobenzene ..	Not to exceed 500 parts per million as residual solvent in finished basic resin in paragraph (a)(1) of this section.
<i>N</i> -methyl-2-pyrrolidone.	Not to exceed 0.01 percent (100 parts per million) as residual solvent in finished basic resin in paragraph (a)(2) of this section.

(c) Polysulfone resins, when extracted at reflux temperatures for 6 hours with the solvents—distilled water, 50 percent (by volume) ethyl alcohol in distilled water, 3 percent acetic acid in distilled water, and *n*-heptane, yield total extractives in each extracting solvent not to exceed 0.0078 milligram per square centimeter (0.05 milligram per square inch) of resin surface. Note: In testing the finished polysulfone resins, use a separate resin test sample for each required extracting solvent.

(d) Polysulfone resins intended for repeated use in contact with food may be used under conditions of use A through