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## VI. Styrene Copolymers and Graft Polymers, and Mixtures of Polystyrene with other Polymers

As of 01.01.2010

There are no objections to the use of modified polystyrenes (co- and graft polymers and/or mixtures of polymers) in the manufacture of commodities in the sense of § 2, Para. 6, No 1 of the Food and Feed Code (Lebensmittel- und Futtermittelgesetzbuch) provided they are suitable for their intended purpose and the following conditions are met:

1. The use of monomers and other starting materials is subject to the Commission Regulation (EU) No 10/2011.

*The evaluation presented in the following refers to polymers from the following monomeric starting substances:*

*Styrene*

*α-Methylstyrene*

*Vinyltoluene*

*Divinylbenzene*

*Acrylonitrile*

*Butadiene*

*Ethylene oxide*

*Di-methacrylic acid ester of 1,3-Butylene glycole, max. 0.15 %*

*Acrylic acid esters of monohydric saturated aliphatic alcohols C<sub>1</sub>-C<sub>8</sub>, in so far as covered by the positive list of the Commission Regulation (EU) No 10/2011*

*Methacrylic acid esters of monohydric saturated aliphatic alcohols C<sub>1</sub>-C<sub>8</sub>, in so far as covered by the positive list of the Commission Regulation (EU) No 10/2011*

*Acrylic acid*

*Methacrylic acid*

*Maleic acid anhydride*

*Ethers of N-methylolmethacrylamide*

*The proportion of styrene and/or α-methyl styrene must predominate in the overall mixture.*

2. Additives permitted by the Commission Regulation (EU) No 10/2011 may be used in compliance with the restrictions stipulated therein. In addition to these, only the following production aids<sup>1</sup> may be used during manufacture and processing of the polymer. Residues or conversion products of these must not occur in the raw polymer or in finished products in amounts greater than the maximum amounts given.

<sup>1</sup> These production aids include polymerisation regulators which are occasionally used (e.g. dodecyl mercaptane) and cross-linking agents. During polymerisation, these substances are completely incorporated in the polymer.

## a) Residues of conversion products from the following catalysts or reaction regulators:

- Azodiisobutyric acid nitrile
- 2,2'-Azobis(2-methylbutyronitrile)
- Benzoyl peroxide
- Diacyl(C<sub>8</sub>-C<sub>12</sub>) peroxides, aliphatic
- Di-tert-butyl peroxide
- tert-Butyl-hydroperoxide
- Diisopropylbenzene hydroperoxide
- Potassium peroxydisulfate
- Sodium metabisulfite
- tert-Butyl-peroxybenzoate
- Cumene hydroperoxide
- tert-Butyl peroxyacetate, max. 0.03 %
- 1,1-Bis-tert-butylperoxy-cyclohexane, max. 0.05 %
- tert-Butylperoxy-(2-ethylhexanoate)
- tert-Butyl-peroxy(2-ethyl-hexyl)carbonate
- O,O-tert-Butyl-O-isopropyl monoperoxycarbonate, max. 0.05 %; 50 % isododecane may be added as desensitising agent
- Bis(1-oxyl-2,2,6,6-tetramethylpiperidin-4-yl)sebacate, max. 0.04 %
- 2,5-Dimethyl-2,5-di(tert-butylperoxy)hexane, max. 0.05 %
- Bis-(1,1-dimethylpropyl)peroxide, max. 0.05 %
- Glucose<sup>2</sup>, max. 0.75 %
- Sodium salt of hydroxymethane sulfinic acid, max. 0.07 %
- Silicon tetrachloride, max. 0.25 %
- Tetrahydrofuran<sup>2</sup>, max. 0.1 %
- n-Butyllithium, the lithium content of the finished product must not exceed 185 mg/kg.
- Mixture of
 

2-Hydroxy-2-sulfinato acetic acid, disodium salt	50 - 60 %
2-Hydroxy-2-sulfonato acetic acid, disodium salt	10 - 20 % and
Sodium sulfite <sup>3</sup>	30 - 40 %, max. 0.5 %.

} in total  
max. 0.2 %

## b) Residues of the following emulsifying or suspending agents, in total max. 2.5 %:

- α-Hydroxy-octadecane sulfonate, sodium salt
- Alkyl sulfonates C<sub>12</sub>-C<sub>20</sub>
- Alkylaryl sulfonates
- Alkyl sulfates<sup>3</sup>
- Polyvinyl alcohol (viscosity of 4 % aqueous solution at 20 °C min. 5 cP)
- Styrene copolymers with maleic or fumaric acid, maleic anhydride, or the alkali metal salts of these acids
- Polyvinyl pyrrolidone and/or copolymers of vinyl pyrrolidone with esters of acrylic acid and methacrylic acid with monohydric saturated aliphatic alcohols C<sub>1</sub>-C<sub>8</sub>
- Sodium and/or potassium salts of natural and dimerised fatty acids
- Sodium and/or potassium dehydroabietate, hydroabietate and abietate
- Polyethylene oxide adducts of monohydric saturated aliphatic alcohols C<sub>12</sub>-C<sub>20</sub><sup>3</sup>
- Poly-N-vinyl-N-methylacetamide<sup>2</sup>, max. 0.4 %

<sup>2</sup> Permitted in accordance with the Commission Regulation (EU) No 10/2011. Migration of this substance into foodstuffs is regulated by the Commission Regulation (EU) No 10/2011.

<sup>3</sup> In parts permitted in accordance with the Commission Regulation (EU) No 10/2011. Migration of this substance into foodstuffs is regulated by the Commission Regulation (EU) No 10/2011.

Sodium salt of sulfosuccinic acid ester with octanol, max. 0.07 %

Disodium dodecyl diphenylether disulfonate, max. 1.5 %,

however, only for copolymers in compliance with Recommendation II<sup>4</sup>; the proportion of polymers complying with this recommendation in the copolymers according to Recommendation II must not exceed 15 %

Triethanol ammonium oleate, max. 0.15 %

X,X-Tricyclo[5.2.1.0<sup>2,6</sup>]decane-dimethyl-bis(hexahydromonophthalate), max. 1.5 %

Copolymer of N-vinyl-N-methyl-acetamide and acrylic acid, 2-ethylhexyl ester, max. 0.4 %.

The proportion of acrylic ester as copolymer must not exceed 10 %.

3. In the manufacture of foamed polymers, besides the expanding agents permitted in accordance with the Commission Regulation (EU) No 10/2011, the following may also be used: aliphatic hydrocarbons with chain lengths up to C<sub>8</sub>. 1000 ml of expanded polymers must contain no more than 2.0 g of this expanding agent as residue.
4. When heated to 90 °C for 24 hours, commodities made from non-expanded material must give off no more than 15 mg/dm<sup>2</sup> of volatile organic components<sup>5</sup>. Commodities made from expanded material may, in addition to this, contain the amount of volatile expanding agent stipulated under No 3.
5. The finished products must not test positively for peroxides.<sup>6</sup>
6. The admixture of polymers or polycondensates to polymers in compliance with No 1 is subject to the Commission Regulation (EU) No 10/2011. The polymers or polycondensates must comply with the BfR Recommendations that have been published. Of the polymers and polycondensates not, or in respect to starting materials not completely, regulated by the Commission Regulation (EU) No 10/2011, the following may be used: Synthetic rubber, provided it complies with amended Recommendation XXI<sup>7</sup>. Copolymers of butadiene or isoprene in the form of sequence polymers, provided they comply with No 2.1.3.1.1.5 of amended Recommendation XXI<sup>7</sup>. However, these mixtures must contain no more than 15 % of the aforementioned sequence polymers if they will come into contact with foodstuffs in which fat forms the external phase. Silicone elastomers, provided they comply with amended Recommendation XV<sup>8</sup>, Section III. The proportion of polymers of styrene and/or  $\alpha$ -methylstyrene and/or vinyl toluene must always predominate in the overall mixture.

<sup>4</sup> Recommendation II "Plasticizer-free Polyvinyl Chloride, Plasticizer-free Copolymers of Vinyl Chloride and Mixtures of these Polymers with other Copolymers and Chlorinated Polyolefins Containing Mainly Vinyl Chloride in the Total Mixture."

<sup>5</sup> Determination method, see 48th Communication on the testing of plastics, Bundesgesundheitsblatt 25 (1982) 334

<sup>6</sup> See 58th Communication on the testing of plastics, Bundesgesundheitsblatt 40 (1997) 412

<sup>7</sup> Recommendation XXI. "Commodities Based on Natural and Synthetic Rubber"

<sup>8</sup> Recommendation XV. "Silicones"