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## XIV. Polymer Dispersions

As of 01.04.2021

There are no objections to the use of plasticizer-free polymer dispersions for coating commodities in the sense of § 2, Para. 6, No. 1 of the Food and Feed Code (Lebensmittel- und Futtermittelgesetzbuch) (refer to part A of this Recommendation) and for cheese coatings not meant to be eaten (refer to part B of this Recommendation), provided that the coated commodities and cheese coatings are suitable for their intended purpose and the following conditions are met:

### Part A: Polymer dispersions for coating commodities intended to come into contact with foods (e.g. adhesives or paper coatings)

The aforementioned restrictions of this Recommendation do not apply to container sealing material, which when properly used does not come into contact with foodstuffs (double-fold seals).

A number of the dispersions manufactured in accordance with this Recommendation can be cross-linked via vulcanisation, in which case Recommendation XXI<sup>1</sup> applies.

Linear polyurethanes, provided they comply with amended Recommendation XLI<sup>2</sup>, may be mixed with polymer dispersions, whereby the proportion of polymer dispersion in the total mixture must predominate.

This Recommendation is valid for coatings that are intended to be used at temperatures up to 90 °C.

If slimicides and preservatives are used that have limit values according to (EG) Nr. 396/2005, these values are also valid for the migration from paper.

#### 1. The following monomers for polymer dispersions may be used:

Monomers or other starting substances listed in the Commission Regulation (EU) No. 10/2011 may be used. Specific limits have to be obeyed.

In addition, the following substances may be used:

- a) Acrylic and methacrylic acid esters of alcohols of chain length C<sub>1</sub>-C<sub>18</sub> which are monohydric saturated and linear (H-(CH<sub>2</sub>)<sub>1-18</sub>-OH), and ether alcohols of chain length C<sub>1</sub>-C<sub>18</sub>, which are monohydric saturated and linear (H-(CH<sub>2</sub>)<sub>1-18</sub>-O-(CH<sub>2</sub>)<sub>1-18</sub>-OH)
- b) Vinyl esters of aliphatic saturated carboxylic acids of chain length C<sub>1</sub>-C<sub>18</sub>
- c) Esters of maleic acid and fumaric acid with monohydric aliphatic saturated alcohols of chain length C<sub>1</sub>-C<sub>18</sub> or with monohydric aliphatic unsaturated alcohols of chain length C<sub>3</sub>-C<sub>18</sub>
- d) Esters of aliphatic carboxylic acids of chain length C<sub>3</sub>-C<sub>12</sub> with unsaturated alcohols of chain length C<sub>3</sub>-C<sub>18</sub>,
- e) Esters of unsaturated aliphatic dicarboxylic acids with polyethylene glycols and/or polypropylene glycols
- f) Vinyl ethers of monohydric aliphatic saturated alcohols of chain length C<sub>1</sub>-C<sub>18</sub>

<sup>1</sup> Recommendation XXI. "Commodities based on natural and synthetic rubber"

<sup>2</sup> Recommendation XLI. "Linear polyurethanes for paper coatings"

- g) Vinylsulfonic acid. Commodities which shall comply with this Recommendation have to meet the following recommended migration limit: 0.05 mg/kg foodstuff or food simulant.
- h) Half-esters of maleic acid or fumaric acid and itaconic acid with monohydric aliphatic saturated alcohols of chain length C<sub>1</sub>-C<sub>18</sub>, max. 8 %, if cross-linking in the film is assured through subsequent treatment, the proportion may be increased to max. 25 %.
- i) Esters of acrylic acid and methacrylic acid with dihydric aliphatic alcohols of chain length C<sub>2</sub>-C<sub>18</sub>
- j) Divinyl and diallyl esters of saturated and unsaturated aliphatic dicarboxylic acids of chain length C<sub>3</sub>-C<sub>18</sub>
- k) Vinyl ester of acrylic acid
- l) Allyl ester of acrylic acid
- m) Vinyl ester of crotonic acid
- n) Allyl ester of crotonic acid
- o) Triallyl cyanurate
- p) 2-Sulfoethylmethacrylate, max. 1.5 %.  
Coatings made using this monomer must not be used for in the packaging of liquid foodstuffs. The specific limit laid down in the Commission Regulation (EU) No 10/2011 has to be obeyed.
- q) 2-(Dimethylamino)ethyl acrylate with a residual content in the finished coating of max. 0.01 mg/dm<sup>2</sup>.
- r) N-[3-(Dimethylamino)propyl]methacrylamide
- s) (2-(Methacryloyloxy)ethyl)trimethylammonium chloride
- t) N,N,N',N'-tetrakis(2-hydroxypropyl)adipamide, max. 6 %, migration into foodstuff or food simulants, respectively must not exceed 5 mg/kg (sum of the substance itself and their impurities 6-[bis(2-hydroxypropyl)amino]-6-oxohexanoic acid and diisopropylamine). Migration of the impurities/ reaction products 1-[(2-hydroxypropyl)amino]-2-propanyl 6-[bis(2-hydroxypropyl)amino]-6-oxohexanoate and bis{1-[(2-hydroxypropyl)amino]-2-propanyl} adipate must not exceed 0,1 mg/kg (sum of the substances).

If single substances that are listed in Commission Regulation (EU) 10/2011 are included in the generic terms stated above specific limits for these substances of the Commission Regulation (EU) 10/2011 have to be obeyed.

## 2. The following production aids may be used:

Additives already permitted by the Commission Regulation (EU) No 10/2011 may be used in accordance with the restrictions laid down therein. In addition to these, the following substances may also be used, but only in the maximum amounts given:

- a) Catalysts:
  - Hydrogen peroxide
  - Benzoyl peroxide
  - Cyclohexanone peroxide
  - Isopropylcumyl hydroperoxide
  - Peroxyulfates of potassium, sodium and ammonium
  - Peroxides of straight-chain saturated aliphatic monocarboxylic acids of chain length C<sub>8</sub>-C<sub>12</sub>
  - tert-Butyl-hydroperoxide
  - Di-tert-butyl peroxide
  - Diisopropyl-peroxycarbonate
  - Azobisisobutyronitrile
  - Acetylcyclohexane sulfonyl peroxide
  - tert-Butyl-perbenzoate
  - tert-Butylperoxy-(2-ethylhexanoate)
  - Bis-(3,5,5-trimethyl)-hexanoylperoxide

- tert-Butyl peroxyvalate, max. 0.15 %; using max. 0.05 % dibutyl phthalate as pasting agent
- Hydroperoxy-pinane, max. 0.2 %
- Iron-III-chloride, max. 0.06 %
- p-Menthane hydroperoxide, max. 0.1 %
- tert-Butyl peroxyacetate, max. 0.2 %
- Mixture of
- |   |                       |
|---|-----------------------|
| 2-Hydroxy-2-sulfonato acetic acid, di-sodium salt | 35 - 60 %             |
| 2-Hydroxy-2-sulfonatoacetic acid, di-sodium salt  | 10 - 60 % and         |
| Sodium sulfite                                    | 0 - 40 %, max. 0.5 %. |
- The commodities must not test positively for peroxides<sup>3</sup>.
- b) Polymerisation regulators:
- Normal and tertiary mercaptanes of chain length C<sub>10</sub>-C<sub>14</sub><sup>4</sup>
- Butene-(1)-ol-(3)
- Hydroxylamine salts
- Sodium dialkyldithiocarbamate
- Sodium bisulfite
- Ammonium bisulfite
- Sodium dithionite
- Isoascorbic acid
- Urea<sup>5</sup>
- Propionaldehyde<sup>5</sup>
- Dispersion films must not contain more than 0.7 % residue or conversion products from a polymerisation regulator, and no detectable levels of butene-(1)-ol-(3) or salts of hydroxyl amine.
- Alkali metal salts of oxymethane sulfinic acid, max. 0.5 %, based on the dispersion film.
- Diisopropylxanthogene disulfide, max. 0.5 %, however, only for dispersions of polyvinylidene chloride.
- Boric acid, max. 0.07 %<sup>6</sup>
- 2,2'-Dibenzamido-diphenyl-disulfide, max. 3.0 % in the dispersion
- 1-Methyl-4-(1-methylethylidene)-cyclohexene. Commodities which shall comply with this Recommendation have to meet the following recommended migration limit: 0.05 mg/kg foodstuff or food simulant
- c) Protective colloids and thickening agents for further processing:
- Polyvinyl alcohol (viscosity of 4 % aqueous solution at 20 °C when used as a protective colloid, min. 2 cP; when used as a thickening agent, min. 4 cP).
- Polymers and copolymers of monomers listed under No. 1, the restrictions set out therein have to be complied with.
- Polyacrylic acid, modified with isopropanol.
- d) Emulsifying agents:
- Sodium hydroxyoctadecane sulfonate
- Sodium, potassium and ammonium salts of hydroxy fatty acids of chain length C<sub>12</sub>-C<sub>20</sub> and their sulfation or acetylation products
- Alkyl sulfates, also as salts of triethanolamine
- Alkyl(C<sub>10</sub>-C<sub>20</sub>) sulfonates
- Alkyl(C<sub>10</sub>-C<sub>20</sub>)-aryl sulfonates<sup>7</sup>

<sup>3</sup> Test method: 58th Communication on the testing of plastics in Bundesgesundheitsblatt 40 (1997) 412

<sup>4</sup> These substances are completely incorporated into the polymer during polymerisation.

<sup>5</sup> The specific limits laid down in the Commission Regulation (EU) No 10/2011 apply to the use of this substance.

<sup>6</sup> For the purpose of reducing residual monomer content. Only in dispersions based on N-hydroxymethyl acrylamide used in the manufacture of material for wiping cloths that may come into contact with foodstuffs.

<sup>7</sup> In part permitted as an additive in accordance with the Commission Regulation (EU) No 10/2011.

- Dimethyldialkyl(C<sub>8</sub>-C<sub>18</sub>) ammonium chloride, max. 0.005 %, based on the dispersion film  
 Acyl-, alkyl-, oleyl- and alkylaryloxyethylates and their sulfation products<sup>7</sup>  
 Sulfosuccinic acid-4-esters with polyethylene glycol nonylphenyl ether (di-sodium salt)  
 Lignosulfonic acid, as well as its calcium, magnesium, sodium and ammonium salts,  
 in total, max. 0.04 mg/dm<sup>2</sup>  
 Disodium dodecyl diphenylether disulfonate  
 Copolymers of ethylene oxide and propylene oxide with a minimum ethylene oxide content  
 of 10 %  
 Lecithine, max. 1 %  
 Disodium-4-[1-methyl-2-[(1-oxo-9-octadecenyl)amino]ethyl]-2-sulfosuccinate, max. 0.8  
 mg/dm<sup>2</sup>.  
 Sulfosuccinic acid-4-esters with polyethylene glycol ethers of monohydric aliphatic alco-  
 hols of chain length C<sub>10</sub>-C<sub>12</sub> (di-sodium salt). Migration into foodstuff or food simulants,  
 respectively must not exceed 2 mg/kg.  
 Sulfosuccinic acid-bis-cyclohexylester, sodium salt. Migration into foodstuff or food simu-  
 lants, respectively must not exceed 5 mg/kg.  
 Alkali metal salts of esters of sulfosuccinic acid with aliphatic saturated monohydric alcohols  
 of chain length C<sub>4</sub>-C<sub>20</sub>. Migration into foodstuff or food simulants, respectively must not  
 exceed 5 mg/kg.  
 Migration of emulsifying agents from the coating of the finished product under normal condi-  
 tion of use must not exceed 5 mg/dm<sup>2</sup>.
- e) Stabilisers (neutralising agents and complexing agents):  
 Alkali metal salts of N-(2-hydroxyethyl)ethylenediamine-triacetic acid, in total max. 0.4 % in  
 the dispersion film  
 Homopolymer of 2-acrylamido-2-methylpropanesulfonic acid and its sodium, potassium and  
 ammonium salts, max. 2 % in the dispersion film
- f) Substances which protect the dispersion against putrefaction:  
 The use of these substances must not result in the finished dispersion film having a  
 preserving effect on foodstuffs.  
 o-Phenylphenol and its sodium and potassium salts, max. 0.3 %  
 3,5-Dimethyl-tetrahydro-1,3,5-thiadiazine-2-thione, max. 0.05 %.  
 1-(3-Chloroallyl)3,5,7-triazo-1-azonia-adamantane chloride<sup>8</sup>; no more than 0.05 mg/dm<sup>2</sup> of  
 this substance may be present in the dispersion film.  
 2-Bromo-2-nitropropane-1,3-diol, max. 0.032 mg/dm<sup>2</sup> in dispersion film, this substance must  
 not be detectable in extract of the finished product.  
 p-Chloro-m-cresol, max. 0.2 %  
 Titanium dioxide/silver chloride with 80 % titanium dioxide and 20 % silver chloride,  
 max. 0.005 %  
 Adduct of 70 % benzyl alcohol and 30 % formaldehyde, max. 0.4 mg/dm<sup>2</sup>  
 3-Iodine-2-propinyl-butyl-carbamate, max. 0.02 %  
 1,2-Dibromo-2,4-dicyanobutane, max. 0.058 %  
 2,2-Dibromo-3-nitrilo-propionamide, max. 0.02 mg/dm<sup>2</sup>  
 Dodecylguanidine-hydrochloride, max. 0.03 %.  
 1,2-Benzisothiazolin-3-one<sup>9</sup>. No more than 80 µg/dm<sup>2</sup> of this substance may be present in  
 the dispersion film.

<sup>8</sup> Migration of this substance into foodstuffs and aqueous simulants is regulated by the Commission Regulation (EU) No 10/2011

<sup>9</sup> The restrictions refer to the application in dispersions. An additional contribution from other applications (e. g. as slimicide or as preservative in the paper production or in printing inks) must comply with the restrictions laid down for these fields. In the extracts of the final products the following levels must not exceeded:  
 Mixture of 5-chloro-2-methyl-4-isothiazolin-3-one (approx. 3 parts) and 2-methyl-4-isothiazolin-3-one (approx. 1 part): 25 µg/dm<sup>2</sup>  
 1,2-Benzisothiazolin-3-one: 80 µg/dm<sup>2</sup>

- As pasting agent no more than 0.6 mg/dm<sup>2</sup> 1,2-propandiole and dipropylene glycol together, and no more than 0.005 mg/dm<sup>2</sup> xanthane, may be used.
- Mixture of 5-chloro-2-methyl-4-isothiazolin-3-one (3 parts) and 2-methyl-4-isothiazolin-3-one (1 part)<sup>9</sup>, in total max. 4 µg/dm<sup>2</sup> in dispersion film
- 2-Methyl-4-isothiazolin-3-one<sup>9</sup>, max. 40 µg/dm<sup>2</sup> in dispersion film
- 1,6-dihydroxy-2,5-dioxahexane, max. 29 µg/dm<sup>2</sup>,
- Besides the aforementioned restrictions, in total dispersion films must contain no more than 0.5 % of these substances.
- Tetrahydro-1,3,4,6-tetrakis-(hydroxymethyl)-imidazo(4,5-d)imidazole-2,5(1H,3H)-dione as formaldehyde donator system with an average ratio of formaldehyde: acetylene diurea of 3.1:1 to 3.5:1, max. 0.5 mg/dm<sup>2</sup> dispersion film, equivalent to a total formaldehyde content of 0.22 mg/dm<sup>2</sup>.<sup>10</sup>
- Zinc pyrithione, max. 8 µg/dm<sup>2</sup>
- N-(3-Aminopropyl)-N-dodecylpropane-1,3-diamine. No more than 10 µg/dm<sup>2</sup> of this substance must be detectable in the extract of the finished product.
- 2,2'-dithiobis[N-methylbenzamide]<sup>9</sup>, max. 30 µg/dm<sup>2</sup>
- 2-Methyl-1,2-benzothiazol-3(2H)-one<sup>9</sup>, max. 25 µg/dm<sup>2</sup>.
- g) Slip agents:
- Paraffin DAB
- Polyethylene, provided that it complies with Recommendation III<sup>11</sup>.
- Butyl stearate
- Altogether, the aforementioned slip agents present in dispersion films must not exceed 1.0 %.
- h) Defoaming agents:
- Triisobutyl phosphate
- Organopolysiloxanes with methyl and/or phenyl groups (silicone oil), inasmuch as their viscosity at 20 °C is no less than 100 Centistokes.
- Condensation product of linear or branched organopolysiloxane polyalkyleneglycol monoalkyl ethers according to Section I, No. 1 of amended Recommendation XV, max. 0.04 %.
- Bis-stearoyl ethylene diamine may be used up to a maximum of 0.015 mg/dm<sup>2</sup> in the dispersion film as stabiliser for the aforementioned defoaming agents.
- The dispersion films must not contain in total more than 0.1 % of the above defoaming agents.
- i) Antioxidants:
- Bis-[(3-cyclohexyl-5-methyl-2-hydroxy)phenyl]-methane
- Bis-[3-(1-methylcyclohexyl)-5-methyl-2-hydroxy-phenyl]-methane
- 2,2'-Methylene-bis-(4-methyl-6-tert-butylphenol)
- 2,6-Di-tert-butyl-4-methylphenol
- 2,2'-Methylene-bis-(4-ethyl-6-tert-butylphenol)
- Phenol and/or cresols, converted with styrene or methylstyrene and/or olefins of chain length C<sub>3</sub>-C<sub>12</sub>
- Styrenated diphenylamine
- Tris(nonylphenyl)phosphite<sup>8</sup>, i.e. tris-(mono-nonylphenyl)-phosphite<sup>8</sup>, also mixed with tris-(di-nonylphenyl)-phosphite<sup>8, 12</sup>

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2-methyl-4-isothiazolin-3-one: 80 µg/dm<sup>2</sup>

2,2'-dithiobis[N-methylbenzamide] and its hydrolysis products 2-methyl-1,2-benzothiazol-3(2H)-one and 2-mercapto-N-methylbenzamide in total no more than 30 µg/dm<sup>2</sup>, determined in dimethyl sulfoxide extract.

<sup>10</sup> brief description: Tetramethylolacetylenediurea (tetramethylolglycoluril) in chemical equilibrium with trimethylolacetylenediurea, dimethylolacetylenediurea, monomethylolacetylenediurea and formaldehyde.

<sup>11</sup> Recommendation III. "Polyethylene"

<sup>12</sup> Purity requirements for tris(nonylphenyl)phosphite: see 76th Communication in Bundesgesundheitsblatt 15 (1972) 139.

Triethyleneglycol-bis[3-(3-tert-butyl-4-hydroxy-5-methyl-phenyl)propionate], max. 0.25 %  
The dispersion films must not contain in total more than 1.0 % of the above antioxidants.

j) Antistatic agents:

N,N-Bis(2-hydroxyethyl)alkyl-(C<sub>12</sub>-C<sub>18</sub>)amines<sup>8</sup>, max. 2.0 mg/dm<sup>2</sup> coated commodity surface made from dispersions of vinylidene chloride copolymer. Commodities treated with this antistatic agent must not come into contact with liquid foodstuffs.

## Part B: Polymer dispersions for the manufacture of cheese coatings not meant to be eaten

If the following Recommendations are fully complied with, it may be assumed that the obligatory care necessary in the manufacture, treatment and putting into circulation of polymer dispersions for cheese coatings has been taken.

It is recommended that only the following substances be used in the manufacture of polymer dispersions:

### 1. Monomers

Ethylene

Vinyl esters of saturated fatty acids of chain length C<sub>2</sub>-C<sub>18</sub>

Esters of maleic acid and fumaric acid with monohydric aliphatic saturated alcohols of chain length C<sub>4</sub>-C<sub>8</sub>

Acrylic acid esters of monohydric aliphatic saturated alcohols of chain length C<sub>4</sub>-C<sub>8</sub>

Mixture of  $\alpha$ -olefins C<sub>14</sub>-C<sub>16</sub>

### 2. Catalysts

Hydrogen peroxide

Potassium, sodium and ammonium peroxydisulfate

Peroxides of even-numbered saturated aliphatic monocarboxylic acids of chain length C<sub>8</sub>-C<sub>12</sub>

tert-Butyl-hydroperoxide

Di-tert-butyl peroxide

Diisopropyl peroxy carbonate

tert-Butylperoxy-(2-ethylhexanoate)

Iron-III-chloride, max. 0.06 %

The finished cheese coating material must not test positively for peroxides<sup>3</sup>.

### 3. Emulsifying agents

Sodium lauryl sulfate

Sodium lauryl ethersulfate, ethoxylated (3 ethylene oxide groups)

Polyethylene glycol ether of oleyl alcohol (4 - 20 ethylene oxide groups)

### 4. Defoaming agents

Dimethylpolysiloxanes (Mw > 6,800 D)

### 5. pH regulator and polymerisation aids

Alkali metal salts of oxymethane sulfinic acid, max. 0.25 %

Sodium and ammonium bisulfite

Sodium dithionite

Isoascorbic acid  
Urea, max. 0.75 %  
Formic acid  
Acetic acid  
Citric acid  
Tartaric acid  
Hydrochloric acid  
Ascorbic acid  
Ammonia  
Sodium hydroxide  
Potassium hydroxide  
Sodium and potassium carbonate and hydrogencarbonate

**6. Protective colloids and thickening agents**

Lactose  
Silicon dioxide  
Hydroxyethyl cellulose  
Methylcellulose  
Hydroxyethylmethyl cellulose  
Carboxymethyl cellulose  
Polyvinyl alcohol (viscosity of 4 % aqueous solution at 20 °C, when used as a protective colloid, min. 2 cP; when used as a thickening agent, min. 4 cP)  
Polyvinyl pyrrolidone  
Xanthane

**7. Dyes**, alone or in combination, which are permitted in the Regulation on Food Additives (Verordnung zur Neuordnung lebensmittelrechtlicher Vorschriften über Zusatzstoffe), as well as naturally coloured foodstuffs.

**8. Preserving agents**, which are permitted in the Regulation on Food Additives (Verordnung zur Neuordnung lebensmittelrechtlicher Vorschriften über Zusatzstoffe).