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## **XXXVI. Paper and board for food contact**

**As of 01.04.2022**

### **Preamble**

1. This Recommendation is valid for single and multi-layered commodities (articles, materials) made of paper or paperboard, as well as fiber casting, which are intended to come into contact with or affect foodstuffs. It includes paper or paperboard which is intended to be used at temperatures up to 90 °C (holding and reheating of food). For the following listed special applications (e.g. higher temperature range) the respective special Recommendation has to be noted:

- For paper that in its intended use will be subject to hot extraction (boil-in-bag packages, tea bags, hot filter papers), and for filter layers that in their intended use will be subject to extraction (filtration) Recommendation XXXVI/1 applies.

- For paper, paperboard and board which comes into contact with or affects foodstuffs during baking Recommendation XXXVI/2 applies. This recommendation also applies for usage in microwave ovens.

- For Absorber pads based on cellulosic fibres for food packaging Recommendation XXXVI/3 applies.

2. Regarding the substance groups that are covered by this Recommendation the following restrictions have to be noted:

a) This Recommendation applies to raw materials (section A), production aids (section B), and special paper refining agents (section C) used in the production process for paper, paperboard and board that comes into contact with foodstuffs. Moreover, in the paper production process substances are used to keep manufacturing devices clean and to protect them from corrosion. This Recommendation shall not apply for these substances. The manufacturer or distributor of the paper is responsible to comply to food regulations (especially Regulation (EU) No. 1935/2004) for these substances<sup>1</sup>. However, substances listed in this Recommendation subject to the above stated applications were listed before 2013.

b) Substances that are used for manufacturing of paper raw materials listed in section A or substances that are used for formulation of active ingredients listed in section B and C (e.g. emulsifiers, solvents, set-up chemicals, stabilizer, pH modifiers) are not subject to this BfR-Recommendation. For their application requirements of article 3 of the Regulation (EU) No. 1935/2004 shall be used<sup>1</sup>. However, substances listed in this Recommendation subject to the above stated applications were listed before 2013. Preservatives that are used to prevent microbial spoilage of formulations and slimicides are still covered by this Recommendation.

<sup>1</sup> For guidance on compliance of the manufacturer's responsibility the following guidelines and assessments of substances may be used exemplarily: other Recommendations of the BfR, assessments of the European Food Safety Authority or the Scientific Committee on Food (SCF), Regulation (EU) No. 10/2011, European rules on food additives and drinking water. Moreover, an assessment can be made by the manufacturer on his own responsibility.

- 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.
3. Methods for testing commodities (materials and articles) made of paper or paperboard are available under [http://www.bfr.bund.de/de/methodensammlung\\_papier\\_\\_karton\\_und\\_pappe-32620.html](http://www.bfr.bund.de/de/methodensammlung_papier__karton_und_pappe-32620.html).
  4. The finished paper or paperboard must have no preserving effect on the foodstuffs with which they come into contact<sup>2</sup>.
  5. To the extent that in this Recommendation the use of certain substances is restricted the maximum quantities given, if not applied to surface area or otherwise stated, refer to the dry finished product.
  6. If in the production of a certain paper or paperboard a particular production aid, on account of its wide spectrum of use, is listed more than once in the Recommendation, the largest maximum amount given is to be taken as the "in total" maximum. Adding the different maximum amounts together is not permissible.
  7. No more than 10 µg/l lead and 5 µg/l cadmium must be detectable in the cold water extract of the finished product.<sup>3</sup>
  8. The migration of aluminium into foodstuffs must not exceed 1 mg/kg<sup>5,6</sup>. Compliance with this requirement can be checked in the cold water extract.<sup>7</sup>
  9. Azo dyes after Annex 1, No. 7 (§ 3) of the Commodities Regulation (Bedarfsgegenstände-verordnung), must not be used in the manufacture of food-contact paper or paper board.<sup>8</sup>
  10. In a composite, multi-layered or coated material, if the layer which comes into contact with the foodstuff is made of paper or paperboard it must comply with this Recommendation. Also, except for traces that are harmless to health and have no effect on taste or smell of the foodstuff, there must be no migration of substances from other layers into foodstuffs or on their surface.
  11. Optical brighteners must not migrate to the foodstuff. Testing is conducted according to DIN EN 648<sup>3</sup>, whereby a value of 5 on the evaluation scale must be reached.
  12. Examples of application of DIN EN 646 and DIN EN 648 for the determination of color fastness are listed in the BfR method compilation.

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<sup>2</sup> DIN EN 1104: "Determination of the transfer of antimicrobial constituents"

<sup>3</sup> Testing is not necessary for paper and paperboard intended for contact with dry and at the same time non-fatty foodstuffs (e.g. flour, semolina, rice, breakfast cereals, breadcrumbs, sugar and salt).

<sup>5</sup> Testing is not necessary for paper and paperboard intended for contact with exclusively fatty foodstuffs, such as butter or vegetable fats, as well as for foodstuffs which, according to Table 2 of Regulation (EU) No 10/2011, are to be tested exclusively with food simulant E.

<sup>6</sup> If the actual use is not known, migration into food shall be tested with a surface area to packed food ratio of 13.3 dm<sup>2</sup>/kg food under the worst foreseeable conditions of use regarding type and duration of contact, contact temperature and food.

<sup>7</sup> For additional information on the determination of aluminium in water extract, see: Method collection paper and paperboard ([https://www.bfr.bund.de/de/methodensammlung\\_papier\\_\\_karton\\_und\\_pappe-32620.html](https://www.bfr.bund.de/de/methodensammlung_papier__karton_und_pappe-32620.html)).

<sup>8</sup> Detecting the use of prohibited azo dyes according to "Amtliche Sammlung von Untersuchungsverfahren nach § 64 LFGB", method B 82.02-2.

13. When applied as specified, primary aromatic amines may not be released from the finished food contact material in a detectable amount. The detection limit is 0.01 mg/kg food or food simulant and applies to the sum of the released primary aromatic amines. Additionally, primary aromatic amines classified as carcinogens in classes 1A and 1B of the CLP Regulation (EC) 1272/2008 may not be released referred to the single substance with a detection limit of 0.002 mg/kg food or food simulant.<sup>9</sup> Measurement uncertainty is not to be applied.

There are no objections to the use of paper or paperboard in the manufacture of commodities in the sense of § 2, Para. 6, No. 1 of the Food and Feed Code (Lebensmittel- und Futtermittelgesetzbuch (LFGB)), provided they are suitable for their intended purpose and comply also with the following conditions:

#### **A. Raw materials<sup>10</sup>**

The following raw materials may be used:

##### **I. Fibrous materials:**

1. Natural and synthetic cellulose fibres, bleached or unbleached.
2. Fibres of synthetic high polymers, provided they comply with the prevailing requirements of food law.
3. Wood pulp, bleached or unbleached.
4. Recycled fibres made from paper or paperboard provided that the finished articles comply with the requirements in the annex of this Recommendation.

##### **II. Fillers:**

Insoluble minerals:

1. Carbonates of calcium and magnesium, silicon dioxide, silicates
2. Mixed silicates of sodium, potassium, magnesium, calcium, aluminium and iron
3. Calcium sulfate
4. Calcium sulfoaluminate (satin white)
5. Barium sulfate (free of soluble barium compounds)
6. Titanium dioxide.
7. Magnesium hydroxide
8. Magnesium oxide
9. Aluminium hydroxide

The fillers listed above must comply with the purity requirements stipulated under No. 3 in Recommendation LII. "Fillers".

10. Microspheres<sup>11</sup> made from a copolymer of vinylidene chloride, methyl methacrylate and acrylonitrile, filled with isobutane, max. 1.5 %, based on the dry fibres weight.

<sup>9</sup> For the determination of primary aromatic amines in the water extracts see: Method collection paper and paperboard ([https://www.bfr.bund.de/de/methodensammlung\\_papier\\_karton\\_und\\_pappe-32620.html](https://www.bfr.bund.de/de/methodensammlung_papier_karton_und_pappe-32620.html)).

<sup>10</sup> Since 2013 additives to raw material are not subject for this Recommendation (see preamble, section 2). The following substances were listed before 2013 and are still part of this Recommendation: a) Xylanase (There must be no detectable residual activity of this enzyme in the finished product.), b) Diethylene triamine pentamethylene phosphonic acid, max. 0.22 %, based on dry, fibres weight, c) Potassium sulfite, max. 0.01 %. Tetrasodium iminodisuccinate, max. 0.17 %, based on dry fibres weight, d) Tetrasodium iminodisuccinate, max. 0.17 %, based on dry fibres weight. The application of the substances mentioned above in accordance with the stated limitations continues to comply with this Recommendation. The application of anthraquinone as additive to raw material is no longer recommended.

11. Activated carbon<sup>12</sup>, the activated carbon must comply with the purity requirements for E 153 established by Regulation (EU) No. 231/2012.

## B. Production aids

The following production aids may be used:

### I. Sizing agents:

1. Colophony, addition products of maleic and fumaric acid and/or of formaldehyde with colophony. No more than 1.0 mg formaldehyde/ dm<sup>2</sup> must be detectable in the extract of the finished product.
2. Casein and animal glue
3. Starch<sup>13</sup>
  - 3.1 Native<sup>14</sup> starch, physically modified starch, enzymatically modified starch and acid-treated starch, as well as the chemically modified starches listed in Annex 2, List B, Part I of the Regulation on Food Additives (Zusatzstoff-Verkehrsverordnung)
  - 3.2 Other modified starches
    - 3.2.1 Bleached starch, also treated with sodium, potassium or ammonium peroxydisulfate, as well as with peroxyacetic acid and/or hydrogen peroxide
    - 3.2.2 Oxidatively degraded starch, also treated with hydrogen peroxide, sodium, potassium or ammonium peroxydisulfate, including dialdehyde starch produced from oxidised starch with an aldehyde content of at least 90 %<sup>15</sup>
    - 3.2.3 Starch esters
      - 3.2.3.1 Monostarch phosphate, also treated with ammonium phosphate or orthophosphoric acid in the presence of urea
      - 3.2.3.2 Starch acetate, also treated with vinyl acetate (specification of starch: max. 2.5 % acetyl groups)
      - 3.2.3.3 Starch succinate
    - 3.2.4 Starch ethers
      - 3.2.4.1 Treated with propylene oxide to produce neutral starch ethers (specification of starch: propylene chlorohydrin, max. 1 mg/kg; degree of substitution (DS), max. 0.2).
      - 3.2.4.2 Treated with monochloroacetate to produce anionic starch ethers (specification of starch: sodium glycolate, max. 0.4 %; degree of substitution, max. 0.08).
      - 3.2.4.3 Treated with 3-chloro-2-hydroxypropyl trimethyl ammonium chloride or glycidyl trimethyl ammonium chloride (specification of starch: epichlorohydrin<sup>16</sup>, max. 1 mg/kg; nitrogen, max. 4.0 %).

<sup>11</sup> The function of the microspheres is to reduce the density of the paper. The initiator, Bis(4-tert-butylcyclohexyl)peroxidicarbonate may be used, max. 0.45 % based on the microspheres.

<sup>12</sup> The substance must comply with the relevant purity requirements of Regulation (EU) No. 231/2012.

<sup>13</sup> The general and specific purity requirements after Annex 2, List A, Part II of the Regulation on Food Additives (Zusatzstoff-Verkehrsverordnung) apply.

<sup>14</sup> Native food starch is a carbohydrate polymer consisting almost entirely of  $\alpha$ -D-glucose units. It occurs in granular form in the organs of certain plants, from which it is extracted.

<sup>15</sup> See method for analysing tobacco additives, "Bestimmung der Dialdehydeenheiten in Oxi- bzw. Dialdehydstärke", Bundesgesundheitsblatt 8 (1965) 110.

<sup>16</sup> 1,3-Dichloro-2-propanol must not be detectable in water extract of the finished product (detection limit 2  $\mu$ g/l). The transfer of 3-monochloro-1,2-propanediol into the water extract of the finished products must be as low as technically achievable, a limit of 12  $\mu$ g/l must not be exceeded in any case.

- 3.2.4.4 Treated with 3-chloro-2-hydroxypropyl trimethyl ammonium chloride and succinic anhydride (specification of starch: epichlorohydrin<sup>16</sup>, max. 1 mg/kg; nitrogen, max. 1.6 %).
- 3.2.5 Starch, cross-linked with epichlorohydrin<sup>16</sup> and treated with 3-chloro-2-hydroxypropyl trimethyl ammonium chloride (specification of starch: epichlorohydrin<sup>16</sup>, max. 1mg/kg; nitrogen, max. 0.5 %).
- 3.2.6 Monostarch phosphate, treated with 3-chloro-2-hydroxypropyl trimethyl ammonium chloride (specification of starch: epichlorohydrin<sup>16</sup>, max. 1 mg/kg; nitrogen, max. 0.5 %).
- 4. Cellulose ether
- 5. Sodium salt of carboxymethyl cellulose, technically pure<sup>17</sup>
- 6. Alginates<sup>13</sup>, xanthane<sup>13</sup>, galactomannans<sup>13</sup>
- 7. Galactomannan ethers
  - 7.1 Carboxymethylgalactomannan, residual content in sodium glycolate max. 0.5 %
  - 7.2 Galactomannan, treated with 3-chloro-2-hydroxypropyl-trimethylammonium chloride or glycidyl-trimethylammonium chloride (specification: epichlorohydrin<sup>16</sup> max.1 mg/kg, nitrogen max. 4.0 %)
- 8. Water-glass and alumina gel
- 9. Dispersions of wax and paraffin, provided the waxes and paraffins comply with amended Recommendation XXV, Part I<sup>18</sup>, in total max. 2.0 %.
- 10. Plastics dispersions, provided they comply with amended Recommendation XIV.
- 11. Reemulsifiable polyvinyl chloride, provided it complies with amended Recommendation II<sup>19</sup>.
- 12. Di-alkyl(C<sub>10</sub>-C<sub>22</sub>)diketenes, which can contain up to 65 % isoalkyl groups, max. 1.0 %. The transfer of dialkylketones, that are produced by hydrolysis, into foodstuff may not exceed 5 mg/kg foodstuff.
- 13. Condensation products of melamine, formaldehyde and ω-aminocaproic acid, max. 1.0 %. No more than 1.0 mg formaldehyde/dm<sup>2</sup> must be detectable in the extract of the finished product.
- 14. Sodium and ammonium salts of copolymers of isopropyl maleate half ester (approx. 25 %), acrylic acid (approx. 16 %) and styrene (approx. 59 %), in total max. 0.5 %, based on weight of the dry paper.
- 15. A mixture consisting of the ammonium salt of a copolymer of styrene and maleic acid anhydride (50 : 50) with a copolymer of butylacrylate and acrylonitrile (70 : 30) in the ratio of 1 : 2, max. 0.6 %, based on weight of the dry paper.
- 16. Ammonium salt of a copolymer of maleic acid anhydride, isopropyl maleate half ester and diisobutylene, max. 0.5 %, based on weight of the dry paper.
- 17. Ammonium salt of a copolymer of styrene (approx. 60 %), acrylic acid (approx. 23 %) and maleic acid (approx. 17 %), max. 0.5 %, based on weight of the dry paper.
- 18. Di-sodium salt of a copolymer of styrene (approx. 50 %) and maleic acid (approx. 50 %), max. 0.7 %, based on weight of the dry paper.
- 19. Cationic, water-soluble polyurethane, cross-linked with epichlorohydrin<sup>16</sup>, made from glycerol monostearate, toluylene diisocyanate and N-methyl diethanol amine (mean mol. wt. 100 000), max. 0.6 %, based on the dry fibres weight  
or  
Cationic, water-soluble polyurethanes, made from glycerol monostearate, toluylene diisocyanate and N-methyl diethanol amine (mean mol. wt. 10 000), max. 0.15 %, based on the fibres weight  
or

<sup>17</sup> The Sodium glycolate content may not exceed 12 %.

<sup>18</sup> Recommendation XXV. " Hard paraffins, microcrystalline waxes and mixtures of these with waxes, resins and plastics "

<sup>19</sup> Recommendation II. "Plasticizer-free polyvinyl chloride ..."

Anionic, water-soluble polyurethanes, made from glycerol monostearate, toluylene diisocyanate, dimethylol propionic acid and N-methyl diethanol amine (mean mol. wt. 10 000), max. 0.15 %, based on the dry fibres weight.

In producing the aforementioned polyurethanes, in each case a maximum of 0.03 % dibutyl tin diacetate, based on the sizing agent, may be used; 1 dm<sup>2</sup> of sized paper must not contain more than 0.3 µg dibutyl tin diacetate. Primary aromatic amines must not be detectable in extract of the finished product.<sup>9</sup>

As preservative for the aforementioned polyurethanes, max. 0.5 % formaldehyde, based on the sizing agent, may be used.

20. Copolymer of maleic acid and dicyclopentadiene (ammonium salt), max. 2.0 mg/dm<sup>2</sup>.
21. 3-Alkenyl(C<sub>15</sub>-C<sub>21</sub>)-dihydrofuran-2,5-dione, max. 1.0 %.
22. Cereal flour
  1. treated with acids
  2. treated with monochloroacetic acid to produce anionic cereal flour ethers (specification: sodium glycolate, max. 0.4 %; degree of substitution, max. 0.08)
  3. treated with glycidyl trimethyl ammonium chloride (specification: epichlorohydrin<sup>16</sup>, max. 1 mg/kg).
  4. physically modified
23. Copolymer of acrylamide and acrylic acid, cross-linked with N,N'-methylene-bis(acrylamide), max. 1.0 %
24. Copolymer of acrylamide, (2-(methacryloyloxy)ethyl)trimethylammonium chloride, N,N'-methylene-bis(acrylamide) and itaconic acid, max. 1.0 %, based on the dry fibres weight.
25. Copolymer of acrylamide, (2-(methacryloyloxy)ethyl)trimethylammonium chloride, N,N'-methylene-bis(acrylamide), itaconic acid and glyoxal, max. 1.0 %, based on the dry fibres weight.
26. Addition product of fumaric acid with colophony, cross-linked with triethanol amine, max. 4.0 %, based on the dry fibres weight.
27. Hydroxyethyl starch
28. Anhydrides of natural fatty acids, max. 0.2 %, based on the dry fibres weight
29. Galactomannane phosphoric acid ester, max. 0.25 %, based on the dry fibres weight
30. High oleic sunflower oil, maleated, max. 0.6 %, based on the dry fibres weight
31. Sucrose esters of natural fatty acids (C<sub>16</sub> or higher)<sup>12</sup> and/or sucroglycerides of natural fatty acids with (C<sub>16</sub> or higher)<sup>12</sup>, max. 1.5 % based on the dry fibre. The content of sucrose esters with a fatty acid chain length of C<sub>14</sub> or lower must not exceed 1 % in the formulation.
31. Mono- and diglycerides of fatty acids (C<sub>14</sub> or higher)<sup>12</sup>
32. Sodium, potassium or calcium salts of natural fatty acids (C<sub>14</sub> or higher)<sup>12</sup>

As emulsifier for the sizing agents, max. 0.02 % sodium-2-stearoyllactylate may be used.

## II. Precipitating, fixing and parchmentisation agents:

1. Aluminium sulfate, aluminium chloride hydroxide, aluminium formate, aluminium nitrate and sodium aluminate
2. Sulfuric acid
3. Ammonia
4. Sodium carbonate, sodium hydrogen carbonate, sodium phosphate
5. Tannin
6. Condensation products of urea, dicyandiamide, melamine with formaldehyde. Extract of the finished products must contain no more than 1.0 mg formaldehyde per dm<sup>2</sup> (compare C I 2 and 3)
7. Condensation products of aromatic sulfonic acids with formaldehyde, max. 1.0 %.

Extract of the finished products must contain no more than 1.0 mg formaldehyde per dm<sup>2</sup> (compare B V 8)

8. Sodium salts of ethylenediamine tetraacetic acid and diethylenetriamine pentaacetic acid and N-(2-hydroxyethyl)ethylenediamine-triacetic acid
9. Gluconic acid
10. Vinylformamide-vinylamine copolymer, max. 0.4 %
11. Polycondensate of dicyandiamide and diethylenetriamine, max. 0.45 %
12. Polyethyleneimine, modified with polyethylene glycol and epichlorohydrin<sup>16, 21</sup>, max. 0.2 %
13. Choline and its salts
14. Copolymer of vinylformamide, vinylamine and acrylic acid, max. 1 %, based on the dry fibres weight

### III. Retention agents:

1. Homopolymers and copolymers of
  - a) Acrylamide
  - b) Acrylic acid
  - c) (3-Acrylamidopropyl)trimethylammonium chloride
  - d) (2-(Acryloyloxy)ethyl)trimethylammonium chloride
  - e) (2-(Methacryloyloxy)ethyl)trimethylammonium chloride
  - f) (2-(Acryloyloxy)ethyl)-N-benzyl-dimethylammonium chloride
 max. 0.1 %, provided that the polymers contain no more than 0.1 % monomeric acrylamide and 0.5 % of the monomers listed under b) - f)<sup>22</sup>.
2. Polyethyleneimine, max. 0.5 %<sup>21, 23</sup> (compare B. IV. 1 and B. V. 11).
3. Cross-linked, cationic polyalkylene amines<sup>23</sup> (compare C. I. 4) i.e.:
 

in total max. 4.0 %:

  - a) Polyamine-epichlorohydrin resin, produced from epichlorohydrin and diaminopropylmethylamine<sup>16</sup>
  - b) Polyamide-epichlorohydrin resin, produced from epichlorohydrin, adipic acid, caprolactam, diethylenetriamine and/or ethylenediamine<sup>16</sup>
  - c) Polyamide-epichlorohydrin resin, produced from adipic acid, diethylenetriamine and epichlorohydrin or a mixture of epichlorohydrin with ammonia<sup>16</sup>
  - d) Polyamide-polyamine-epichlorohydrin resin, produced from epichlorohydrin, adipic acid dimethyl ester and diethylenetriamine<sup>16</sup>
  - e) Polyamide-polyamine-dichloroethane resin, produced from 1,2-dichloroethane and an amide of adipic acid, caprolactam and diethylenetriamine
  - f) Polyamide-epichlorohydrin resin, produced from epichlorohydrin, diethylenetriamine, adipic acid and ethyleneimine<sup>16, 21</sup>, max. 0.5 %
  - g) Polyamide-epichlorohydrin resin, produced from adipic acid, diethylenetriamine and a mixture of epichlorohydrin and dimethylamine<sup>16, 24</sup>, max. 0.2 %
  - h) Polyamide-epichlorohydrin resin, produced from polyepichlorohydrin, diethylenetriamine and a mixture of epichlorohydrin and dimethylamine<sup>16, 24</sup>, max. 0.2 %

<sup>21</sup> No ethyleneimine must be detectable in the resin (detection limit 0.1 mg/kg).

<sup>22</sup> Hydrocarbon solvents (paraffinic, naphthenic, with a chain length from C<sub>10</sub> to C<sub>20</sub>) can be used as formulating agents. These solvents must comply with the "Purity requirements for liquid paraffins" in the 155th Communication of Bundesgesundheitsblatt 25 (1982) 192. The transfer of these parts of solvents with a chain length from C<sub>10</sub> to C<sub>16</sub> from the final product (in)to the foodstuff must not exceed 12 mg/kg foodstuff (preliminary limit). For parts of solvents with a chain length from C<sub>16</sub> to C<sub>20</sub> from the final product (in)to the foodstuff may not exceed 4 mg/kg foodstuff (preliminary limit).

<sup>23</sup> This production aid becomes firmly attached to the cellulose fibre. However, if under certain conditions of use, significant amounts of it, or its conversion products, may migrate out of the paper, appropriate testing instructions will be published at a future date.

<sup>24</sup> Dimethylamine must not be detectable in the aqueous extract (detection limit: 0.002 mg/dm<sup>2</sup>).

- i) Polyamide-epichlorohydrin resin, produced from epichlorohydrin, diethylenetriamine, adipic acid, ethyleneimine and polyethylene glycol<sup>16, 21</sup>, max. 0.2 %
  - j) Polyamide-polyamine-epichlorohydrin resin, produced from epichlorohydrin, adipic acid dimethyl ester, glutaric acid dimethyl ester and diethylenetriamine<sup>16</sup>, max. 2.0 %
  - k) Polyamide-polyamine-dichloroethane resin, produced from adipic acid, diethylenetriamine and 1,2-dichloroethane, max. 0.2 %
  - l) Polyamide-polyamine-dichloroethane resin, produced from adipic acid, diethylenetriamine, and a mixture of ethylenediamine, diethylenetriamine, triethylenetetramine, tetraethylenepentamine, pentaethylenhexamine, aminoethylpiperazine and 1,2-dichloroethane, max. 0.2 %
  - m) Polyamine-dichloroethane resin, produced from bis-(3-aminopropyl)-methylamine and 1,2-dichloroethane, max. 0.2 %
  - n) Polyamideamine-polyetheramine-epichlorohydrin resin, produced from diethylenetriamine, caprolactam, adipic acid, polyethylene glycol and epichlorohydrin<sup>16</sup>, max. 0.2 %
  - o) Polyamidoamine-ethyleneimine resin, produced from adipic acid, a mixture of ethylenediamine and N-(2-aminoethyl)-1,3-propylenediamine, N,N'-[bis-(3-aminopropyl)]-1,2-ethylenediamine, ethyleneimine, epichlorohydrin and polyethylene glycol<sup>16, 21</sup>, max. 0.2 %
4. High-molecular, cationic polyamide amine, produced from triethylenetetramine and adipic acid with a content of 15 % diethylene glycol monomethyl ether (as diluting agent) or a mixture of 70 parts of this polyamide amine solution with 30 parts of sulfatised sperm oil, in each case no more than 0.2 % (calculated as polyamide amine in dry the fibre).
5. a) Mixture of  
Polyamide-epichlorohydrin resin, produced from adipic acid, diethylenetriamine and a mixture of epichlorohydrin and dimethylamine<sup>16, 24</sup>, max. 0.05 %, linear, high-molecular polyethylene oxide, max. 0.015 % and a condensation product of xylene sulfonic acid, dihydroxydiphenylsulfone and formaldehyde (sodium and ammonium salt), max. 0.1 %
- b) Mixture of  
Polyamide-epichlorohydrin resin, produced from adipic acid, diethylenetriamine and a mixture of epichlorohydrin and dimethylamine<sup>16, 24</sup>, max. 0.05 %, linear, high-molecular polyethylene oxide, max. 0.015 % and a condensation product of  $\beta$ -naphtholsulfonic acid, phenol and formaldehyde as sodium salt, max. 0.06 %
- The limits given above under a) and b) for individual components are based on dry fibres weight of the particular paper.
6. Reaction product of polyacrylamide with formaldehyde and dimethylamine<sup>24, 26</sup>, max. 0.06 %, based on weight of the dry paper. Extract of the finished products must not contain more than 1.0 mg formaldehyde per dm<sup>2</sup>.
7. Copolymer of dimethylamine and epichlorohydrin<sup>16, 24</sup>, max. 0.25 %
8. Copolymer of dimethylamine ethylenediamine and epichlorohydrin<sup>16, 24</sup>, max. 3 %
9. Homopolymers and copolymers of vinylformamide and vinylamine, max. 0.2 %
10. Copolymer of acrylamide and diallyldimethyl ammonium chloride, max. 0.02 %, based on the dry fibres weight.
11. Polydimethyldiallyl ammonium chloride, max. 0.15 %
12. Vinylamine-diallyldimethylammoniumchlorid-copolymer, made by Hofmann degradation of the amide groups of a acrylamid-diallyldimethylammoniumchloride copolymer, max. 0.5 % based on the dry fibres weight

<sup>26</sup> Residual monomeric acrylamide, based on the reaction product of polyacrylamide with formaldehyde and dimethylamine, must not exceed 0.1 %.



13. Copolymer of acrylamid and (2-(acryloyloxy)ethyl)trimethylammonium chloride, max. 1 %, provided that the polymers contain no more than 0.1 % monomeric acrylamide and 0.05 % of (2-(acryloyloxy)ethyl)trimethylammonium chloride.
14. Reaction product of polyvinylamine with (3-acrylamidopropyl)trimethylammonium chloride, max.0.075%, based on the dry fibres weight. The content of (3-acrylamidopropyl)trimethylammonium chloride and related substances must in sum not exceed 1.25 µg per g finished paper product.
15. Reaction product of polyvinylamine with (3-acrylamidopropyl)trimethylammonium chloride and acrylamide, max.0.2%, based on the dry fibres weight. The content of (3-acrylamidopropyl)trimethylammonium chloride and related substances must in sum not exceed 1.25 µg per g finished paper product.

#### IV. Dewatering accelerators:

1. Polyethyleneimine, max. 0.5 %<sup>21, 23</sup> (compare B. III. 2 and B. V. 11).
2. Alkylaryl sulfonates, max. 1.0 %<sup>27</sup>.
3. Silicone-containing paraffin dispersions, provided that the silicones and paraffins comply with amended Recommendations XV<sup>28</sup> and XXV, Part I<sup>18</sup>, max. 0.5 % (based on dispersion dry substance)
4. Lignosulfonic acid, as well as its calcium, magnesium, sodium and ammonium salts, in total, max. 1.0 %
5. Cellulase<sup>29</sup>
6. Water-glass, stabilised with 0.42 % sodium tetraborate, based on the formulation.

#### V. Dispersion and flotation agents:

1. Polyvinylpyrrolidone (mol. wt. min. 11 000)
  2. Alkyl (C<sub>10</sub>-C<sub>20</sub>) sulfonates
  3. Alkylaryl sulfonates (compare B. IV. 2)
  4. Alkali salts of mainly linear-condensed polyphosphates. The content of cyclic-condensed metaphosphates must not exceed 8.0 %
  5. Polyethylene glycol (EO = 1-20) ethers of linear and branched primary (C<sub>8</sub>-C<sub>26</sub>) alcohols, max. 0.3 mg/dm<sup>2</sup> and Polyethylene glycol (EO > 20) ethers of linear and branched primary (C<sub>8</sub>-C<sub>26</sub>) alcohols, max. 5 mg/dm<sup>2</sup>
  6. Alkylphenol polyglycol ether with 6 - 12 ethylene oxide groups<sup>30</sup>
  7. Sulfonated castor oil
  8. Condensation products of aromatic sulfonic acids with formaldehyde. Extract of the finished products must contain no more than 1.0 mg formaldehyde per dm<sup>2</sup> (compare B. II. 7)
  9. Lignosulfonic acid, as well as its calcium, magnesium, sodium and ammonium salts
  10. Sodium lauryl sulfate
- Of the production aids listed under 1. to 10. up to 1 % of each may be used, but in total no more than 3.0 %.
11. Polyethyleneimine, max. 0.5 %<sup>21, 23</sup> (compare B. III. 2 and B. IV. 1)
  12. Sodium, polyacrylic acid, max. 0.5 %
  13. Alkyl(C<sub>13</sub>)polyglycol ether with 5 - 7 ethylene oxide groups and 1 - 2 terminal propylene oxide groups, max. 0.014 %
  14. Citric acid
  15. 1,2-Dihydroxy-C<sub>12</sub>-C<sub>14</sub>-alkyloxethylates, max. 1.0 %, based on the dry fibres weight

<sup>27</sup> This production aid is washed out to the paper during manufacture.

<sup>28</sup> Recommendation XV. "Silicones"

<sup>29</sup> There must be no detectable residual activity of this enzyme in the finished product.

<sup>30</sup> The restrictions of Regulation (EU) No 1907/2006 concerning Nonylphenol ethoxylate have to be obeyed.

16. 2-Amino-2-methyl-1-propanol; no more than 0.25 mg/dm<sup>2</sup> must be detectable in extract of the finished product.
17. 2-Phosphonobutane-1,2,4-tricarboxylic acid, max. 0.01 %, based on the dry fibres weight.
18. Polyaspartic acid, max. 0.5 %
19. Reaction product of 2-ethylhexylglycidyl ether with polyethylene glycol, max. 0.71 mg/dm<sup>2</sup>  
The reaction product has to comply with the following specification:  
Number average molecular weight (Mn) ≥ 9 000 daltons +/- 1 500 daltons  
Weight average molecular weight (Mw) ≥ 10 000 daltons +/- 1 500 daltons  
Polydispersity index (Mw/Mn) = 1.0 - 1.3  
2-ethylhexylglycidyl ether must not be detectable in the final product (limit of detection: < 0.02 µg/dm<sup>2</sup> paper).
20. Polyethylene glycol ester of castor oil, max. 5 mg/dm<sup>2</sup>
21. 2-Aminoethanol, max. 0.41 mg/dm<sup>2</sup>
22. 1-Amino-2-propanol. The substance may not contain more than 10 % of 2-amino-1-propanol. The transfer into foodstuff may in sum not exceed 5 mg/kg.

## VI. Defoamers:

1. Organopolysiloxanes with methyl and/or phenyl groups (silicone oil) according to Section I of Recommendation XV<sup>28</sup>. Kinematic viscosity of the silicone oils, determined according to DIN 51 562 at 20 °C, min. 100 mm<sup>2</sup> s<sup>-1</sup>.
  2. Triisobutylphosphate
  3. Linear primary alkan-1-oles/alken-1-oles with 8-26 carbon-units(fatty alcohols), also in emulsified form<sup>31</sup>
  4. Fatty acid esters of mono and polyhydric aliphatic alcohols (C<sub>1</sub>-C<sub>22</sub>)
  5. Fatty acid esters with polyethylene glycol and/or polypropylene glycol
  6. Alkylsulfonamides (C<sub>10</sub>-C<sub>20</sub>)
  7. Liquid paraffins, max. 0.1 % (for purity requirements see 155th Communication).
  8. Gelatine
- Of each of the production aids listed under 1. to 8. no more than 0.1 % may be used.
9. Copolymer of glycerol with ethylene oxide and propylene oxide, esterified with coconut fatty acid or oleic acid, of each max. 0.075 %
  10. N,N'-Ethylene-bis-stearamide
  11. Sorbitan monostearate, polyoxyethylene sorbitan monostearate, polyoxyethylene sorbitan monooleate, each max. 10 mg/dm<sup>2</sup>
  12. Sorbitan monooleate, max. 0.1 %
  13. Edible oil
  14. Sodium di-(2-ethylhexyl) sulfosuccinate, max. 0.001 %, based on the dry fibres weight
  15. Poly-(ω-hydroxy-(polyoxyethylene-polyoxypropylene-propyl)methylsiloxane)-co-polydimethylsiloxane reaction product with hexamethylenediisocyanate, max. 0.0004 % based on dry fibres weight
  16. Polypropylene glycol, max. 1 mg/dm<sup>2</sup>
  17. Poly(ethylene propylene) glycol, max. 1 mg/dm<sup>2</sup>
  18. a) 2,4,7,9-tetramethyl-5-decyne-4,7-diol  
b) 3,6-dimethyl-4-octyne-3,6-diol  
c) 2,5,8,11-tetramethyl-6-dodecyne-5,8-diol  
The transfer of these three substances (a-c) from the final product (in)to foodstuff may not exceed 0.05 mg/kg foodstuff in sum.

<sup>31</sup> Max. 2 % liquid paraffin, sodium monoalkyl-dialkylphenoxybenzene-disulfonate, max. 2 %, and a total of max. 2 % alkyl and alkyaryloxethylates and their esters with sulfuric acid (as emulsifiers) may be added to 20 - 25 % aqueous solutions of this antifoam agent. The liquid paraffins must comply with the "Purity requirements for liquid paraffins" in the 155th Communication of Bundesgesundheitsblatt 25 (1982) 192.

19. Distillation residue from the alcohol production of linear long-chain alcohols according to the Ziegler process. The product consists of linear alcohols C<sub>18</sub>-C<sub>30</sub> (70-85 %, thereof C<sub>20</sub> 30-45 %, C<sub>22</sub> 21-39 %, C<sub>24</sub> 4-12 %, C<sub>26</sub> 1-7 %), branched alcohols C<sub>18</sub>-C<sub>30</sub> (3-12 %), paraffins C<sub>20</sub>-C<sub>32</sub> (0,7-2,5 %), esters C<sub>20</sub>-C<sub>40</sub> (4-9 %) and ethers C<sub>22</sub>-C<sub>40</sub> (1-6 %) (synonym: ethene, homopolymer, oxidized, hydrolyzed, distillation residues, from C16-18 alcohols manuf.), max. 0.0225 %, based on the dry fibres weight. The distillation residue must not contain more than 0.1 % steranes of plant origin (e.g. stigmastane). The transfer into foodstuff must not exceed 5 mg/kg.
20. Distillation residue from the alcohol production of linear long-chain alcohols according to the Ziegler process. The product consists of linear alcohols C<sub>18</sub>-C<sub>30</sub> (50-70 %, thereof C<sub>20</sub> 25-35 %, C<sub>22</sub> 10-20 %, C<sub>24</sub> 4-12 %, C<sub>26</sub> 1-7 %), branched alcohols C<sub>18</sub>-C<sub>30</sub> (12-20 %), paraffins C<sub>20</sub>-C<sub>32</sub> (1-4 %), esters C<sub>20</sub>-C<sub>40</sub> (6-12 %) and ethers C<sub>22</sub>-C<sub>40</sub> (0.5-4 %) (synonym: ethene, homopolymer, oxidized, hydrolyzed, distillation residues, from C16-18 alcohols manuf.), max. 0.0225 %, based on the dry fibres weight. The transfer into foodstuff must not exceed 5 mg/kg.

## VII. Slimicides:

- a) Enzymatic agents
  1. Fructose polysaccharide (levan)-hydrolase, 12.5 mg dry substance per kg paper. No more than one unit of levanase activity must be detectable.
- b) Antimicrobial agents
  1. Hydrogen peroxide, as well as peroxyacetic acid, max. 0.1 %, based on dry fibres weight.
  2. 1,4-Bis(bromoacetoxy)butene. Extract of the finished products must contain no more than 0.01 mg bromine per dm<sup>2</sup>.
  3. 3,5-Dimethyl-tetrahydro-1,3,5-thiadiazine-2-thione. This substance must not be detectable in extract of the finished products.
  4. Methylene-bis-thiocyanate. This substance must not be detectable in extract of the finished products.
  5. 2-Bromo-2-nitropropane-1,3-diol, max. 0.003 %, based on dry fibres weight. This substance must not be detectable in extract of the finished product.
  6. 2,2-Dibromo-3-nitrilopropionamide, max. 0.0045 %, based on dry fibres weight. This substance must not be detectable in the extract of the finished products.
  7. 1,2-Dibromo-2,4-dicyanobutane, max. 0.005 %, based on dry fibres weight. This substance must not be detectable in extract of the finished product (detection limit of method of analysis: 0.6 µg/dm<sup>2</sup>).
  8. Glutaraldehyde, max. 2.5 %, based on dry fibres weight. No more than 2 mg glutaraldehyde must be detectable in 1 kg of finished product.
  9. 1-Bromo-3-chloro-5,5-dimethylhydantoin, max. 0.04 %, based on dry fibres weight. No hypochlorite and hypobromite must be detectable in the extract of the finished product.
  10. Didecyl dimethyl ammonium chloride, max. 0.05 %, based on the dry fibres weight.
  11. 2-(Thiocyanatomethylthio)-benzothiazole, max. 0.00045 %, based on dry fibres weight.
  12. Tetrakis(hydroxymethyl)phosponium sulfate.  
The extract of the finished products must contain no more than 0.15 ppm of this substance.
  13. Ammonium bromide/sodium hypochlorite adduct, ammonium sulfate/sodium hypochlorite adduct or ammonium chloride/sodium hypochlorite adduct max. 0.02 % (active substance determined and calculated as Cl<sub>2</sub>), based on the dry fibres weight.
  14. Chlorine dioxide.
  15. 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 diu-

- rea of 3.1 : 1 to 3.5 : 1. In the extract of the finished products not more than 0.3 mg/dm<sup>2</sup>, corresponding to 0.1 mg formaldehyde/dm<sup>2</sup>, must be detectable<sup>32</sup>.
16. Sodium hypochlorite, max. 0.028 %, based on the dry fibres weight<sup>33</sup>.
  17. Mixture of 5-chloro-2-methyl-4-isothiazolin-3-one (approx. 3 parts) and 2-methyl-4-isothiazolin-3-one (approx. 1 part)<sup>34</sup>. No more than 0.5 µg/dm<sup>2</sup> of the mentioned isothiazolinones in total must be detectable in the extract of the finished product.
  18. 1,2-Benzisothiazolin-3-one<sup>34</sup>. No more than 10 µg/dm<sup>2</sup> of this substance must be detectable in the extract of the finished product.
  19. 2-methyl-4-isothiazolin-3-one<sup>34</sup>. No more than 1 µg/dm<sup>2</sup> of this substance must be detectable in the extract of the finished product.
  20. 1,6-dihydroxy-2,5-dioxahexane, max. 0.029 %. No more than 1.0 mg/dm<sup>2</sup> of formaldehyde must be detectable in the extract of the finished product.
  21. Alkali-stabilised solution of hypobromite, max. 0.07 %, based on the dry fibres weight. The sodium hypobromite content of the solution is max. 10 % and the sodium sulfamate content is max. 12 %.
  22. Active bromine generated from hydrogen bromide, sodium hypochlorite and urea, max. 0.02 % (active substance determined and calculated as Cl<sub>2</sub>), based on the dry fibers weight

### VIII. Preservatives:

1. Sorbic acid
2. Formic acid
3. Adduct of 70 % benzyl alcohol and 30 % formaldehyde  
Extract of the finished products must contain no more than 1.0 mg formaldehyde/dm<sup>2</sup>.
4. o-Phenyl phenol and its sodium and potassium salts, max. 0.01 %
5. Mixture of 5-chloro-2-methyl-4-isothiazolin-3-one (approx. 3 parts) and 2-methyl-4-isothiazolin-3-one (approx. 1 part)<sup>34</sup>. No more than 0.5 µg/dm<sup>2</sup> of the mentioned isothiazolinones in total must be detectable in the extract of the finished product.
6. 1,2-Benzisothiazolin-3-one<sup>34</sup>. No more than 10 µg/dm<sup>2</sup> of this substance must be detectable in the extract of the finished product.
7. 2-methyl-4-isothiazolin-3-one<sup>34</sup>. No more than 1 µg/dm<sup>2</sup> of this substance must be detectable in the extract of the finished product.
8. Zinc pyrithione, max. 17 µg/dm<sup>2</sup>
9. 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.
10. 2-Octyl-2H-isothiazol-3-one. No more than 5 µg/dm<sup>2</sup> of this substance must be detectable in the extract of the finished product.
11. 2,2'-dithiobis[N-methylbenzamide]<sup>34</sup>
12. Dodecylguanidine hydrochloride, max. 0.02 % based on the dry fibres weight

<sup>32</sup> brief description: Tetramethylolacetylenediurea (tetramethylolglycoluril) in chemical equilibrium with trimethylolacetylenediurea, dimethylolacetylenediurea, monomethylolacetylenediurea and formaldehyde.

<sup>33</sup> For the stabilization of sodium hypochlorite 0.05 % (based on the dry fibres weight) 5,5-Dimethyl hydantoin, also in the form of the sodium salt, may be used.

<sup>34</sup> The restrictions refer to the application of these substances as slimicides and preservatives, respectively, during the manufacture of paper. Contributions from other applications (e. g. in dispersions according to Recommendation XIV or in printing inks) must comply with the restrictions laid down for these areas. In the extracts of the final products the following levels must not be exceeded in total:

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>

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

### 13. 2-Methyl-1,2-benzothiazol-3(2H)-one<sup>34</sup>, max. 15 µg/dm<sup>2</sup>

The preservatives listed above must only be used in the amounts necessary to protect the raw materials (Section A), processing aids (Section B), and paper refining agents (Section C) from deterioration and decay.

## C. Special Paper refining agents

The following paper refining agents may be used:

### I. Wet-strength agents:

1. Glyoxal. Extract of the finished product must not contain more than 1.5 mg glyoxal per dm<sup>2</sup>.
2. Urea-formaldehyde resins. Extract of the finished product must not contain more than 1.0 mg formaldehyde per dm<sup>2</sup>.
3. Melamine-formaldehyde resins. Extract of the finished product must not contain more than 1.0 mg formaldehyde per dm<sup>2</sup>.
4. Cross-linked, cationic polyalkylene amines<sup>16, 23</sup> (compare B. III. 3.), in total max. 4.0 %:
  - a) Polyamine-epichlorohydrin resin, produced from epichlorohydrin and diaminopropyl methylamine (compare B. III. 3. a)
  - b) Polyamide-epichlorohydrin resin, produced from epichlorohydrin, adipic acid, caprolactam, diethylenetriamine and/or ethylenediamine (compare B. III. 3. b)
  - c) Polyamide-epichlorohydrin resin, produced from adipic acid, diethylenetriamine and epichlorohydrin or a mixture of epichlorohydrin with ammonia (compare B. III. 3. c)
  - d) Polyamide-polyamine-epichlorohydrin resin, produced from epichlorohydrin, adipic acid dimethyl ester and diethylenetriamine (compare B. III. 3. d)
  - e) Polyamide-polyamine-epichlorohydrin resin, produced from epichlorohydrin, an adipic acid amide and diaminopropylmethylamine
  - f) Polyamide-epichlorohydrin resin, produced from epichlorohydrin, diethylenetriamine, adipic acid, ethyleneimine and polyethylene glycol, max. 0.2 %<sup>21</sup>
  - g) Polyamide-epichlorohydrin resin, produced from bis-(3-aminopropyl)methylamine, adipic acid and epichlorohydrin, max. 1.0 %
  - h) Polyamide-epichlorohydrin resin, produced from bis-(3-aminopropyl)methylamine, epichlorohydrin, urea and oxalic acid, max. 1.0 %
  - i) Polyamide-epichlorohydrin resin, produced from diethylenetriamine, adipic acid, glutaric acid, succinic acid and epichlorohydrin
  - j) Polyamide-epichlorohydrin resin, produced from diethylenetriamine, triethylene-tetramine, adipic acid and epichlorohydrin.
  - k) Polyamide-epichlorohydrin resin, produced from adipic acid, diethylenetriamine, aminoethylpiperazine and epichlorohydrin, max. 1.0 %. In the resin the proportion of aminoethylpiperazine in relation to adipic acid must not exceed 10 mol%.
5. Vinylformamide-vinylamine copolymer, max. 1.0 %.
6. Polyhexamethylene-1,6-diisocyanate, modified with polyethylene glycol monomethyl ether, max. 1.2 %.
7. Polyhexamethylene-1,6-diisocyanate, modified with polyethylene glycol monomethyl ether and N,N-dimethylaminoethanol, max. 1.2 %.
8. Terpolymer of acrylamide, diallyldimethyl ammonium chloride and glyoxal, max. 2 %, based on the dry fibres weight. Extract of the finished product must not contain more than 1.5 mg glyoxal per dm<sup>2</sup>.
9. Copolymer of hexamethylenediamine and epichlorohydrin<sup>16</sup>, max. 2 %

10. Copolymer of diethylenetriamine, adipic acid, 2-aminoethanol and epichlorohydrin<sup>16</sup>, max. 0.1 %, based on the dry fibres weight
11. Copolymer of diethylenetriamine, adipic acid, acetic acid and epichlorohydrin<sup>16</sup>, max. 2 %, based on the dry fibres weight  
This copolymer must only be used in the manufacture of kitchen rolls.
12. Copolymer of vinylformamide and acrylic acid, max. 1 %, based on the dry fibres weight
13. Copolymer of acrylamide and diallylamine, max. 1.0 % based on the dry fibres weight
14. Microfibrillated Cellulose, max. 5 %, based on the dry fibres weight. Only to be used in the middle ply of a multi ply board.
15. Microfibrillated Cellulose formed by grinding of cellulose pulp and a mineral according to section A.II (Fillers), max. 5 % Microfibrillated Cellulose by weight, based on the dry fibres weight of the paper. The fibre content of the ground mixture is 20-50% by weight. 70-80% of fibril diameters by number are less than 100 nm, the mean fibril diameter by number is 20-40 nm.

## II. Humectants:

1. Glycerol
2. Polyethylene glycols which contain no more than 0.2 % monoethylene glycol
3. Urea
4. Sorbitol
5. Saccharose, glucose, glucose syrup
6. Sodium chloride, calcium chloride
7. Sodium nitrate, but only together with urea.

In total max 7.0 % of the substances listed above may be used.

## III. Colorants and optical brighteners:

1. There must be no migration of colorants to the foodstuff. Testing is conducted according to DIN EN 646<sup>3</sup>, whereby grade 5 on the so-called grey scale must be reached.
2. Sulfonated stilbene derivates, max. 0.3 %.

## IV. Surface refining and coating agents:

1. Plastics (films, melts, solutions, laquers, dispersions), provided they comply with the prevailing requirements of food law.
2. Paraffins, microcrystalline waxes, low-molecular polyolefins and polyterpenes, provided they comply with amended Recommendation XXV<sup>18</sup>. The second sentence of No. 1 above applies here likewise.
3. Polyvinyl alcohol (viscosity of 4 % aqueous solution at 20 °C, min. 5 cP).
4. Silicone oils with special additives after Section I, No. 3 of Recommendation XV and/or silicone resins or silicone elastomers (silicone rubber) in compliance with Sections II and III of Recommendation XV<sup>28</sup>.
5. Chromium(III)chloride complexes with saturated straight-chain fatty acids of chain length C<sub>14</sub> and longer, max. 0.4 mg/dm<sup>2</sup>, based on chromium. Cold water extract of the finished product must contain no more than 0.004 mg chromium(III)/dm<sup>2</sup>, while chromium (VI) must not be detectable.
6. Aluminium, calcium, sodium, potassium and ammonium salts of straight-chain aliphatic carboxylic acids of chain length C<sub>12</sub>-C<sub>20</sub>. These must comply with the general purity requirements (Annex I, No. 2) of the Regulation on Food Additives (Zusatzstoffverkehrsverordnung).

7. Casein (compare B I No. 2) and vegetable proteins
8. The product list under B I No. 3 (starch)
9. Galactomannans<sup>13</sup>
10. Galactomannan ethers
  - 10.1 Carboxymethylgalactomannan, residual content in sodium glycolate max. 0.5 %
  - 10.2 Galactomannan, treated with 3-chloro-2-hydroxypropyl-trimethylammonium chloride or glycidyl-trimethylammonium chloride (specification: epichlorohydrin<sup>16</sup> max. 1 mg/kg, nitrogen max. 4.0 %)
11. Sodium salt of carboxymethyl cellulose, technically pure<sup>17</sup>
12. Methyl cellulose<sup>13</sup>
13. Hydroxyethyl cellulose<sup>13</sup>
14. Natural and synthetically produced, insoluble mineral compounds that are harmless to health (compare A II).
15. Alginates<sup>13</sup>
16. Xanthane<sup>13</sup>
17. Ammonium zirconium carbonate, max. 1.0 mg/dm<sup>2</sup> (based on zirconium dioxide, ZrO<sub>2</sub>)
18. Copolymer of vinyl alcohol and isopropenyl alcohol. Viscosity of 4 % aqueous solution at 20 °C, min. 5 mPa·s.
19. Basic potassium zirconium carbonate, max. 1.25 mg/dm<sup>2</sup>, expressed as ZrO<sub>2</sub>.
20. Di(hydrogenated tallow fatty acids-2-hydroxyethyl ester)dimethyl ammonium chloride, max. 0.06 %.
21. Imidazolium compounds, 2-(C<sub>17</sub>- and C<sub>17</sub>-unsaturated alkyl)-1-[2-(C<sub>18</sub>- and C<sub>18</sub>- unsaturated amido)ethyl]-4,5-dihydro-1-methyl-, methylsulfates or imidazolium compounds, 2-(C<sub>17</sub>- and C<sub>17</sub>-unsaturated alkyl)-1-[2-(C<sub>18</sub>- and C<sub>18</sub>- unsaturated amido)ethyl]-4,5-dihydro-1-ethyl-, ethylsulfates, max. 0.5 %, based on the dry fibres weight
22. Phosphoric acid ester of ethoxylated perfluoropolyetherdiol, max. 1.5 %, based on the dry fibres weight.
23. Modified polyethylene terephthalates, manufactured from polyethylene terephthalate and one or more of the following substances or substance classes: Ethylene glycol and/or diethylene glycol, trimethylolpropane, pentaerythritol, C<sub>16</sub>-C<sub>22</sub> fatty acids and their triglycerides, isophthalic acid and trimellitic acid anhydride, max. 0.1 g/dm<sup>2</sup>
24. Perfluoropolyetherdicarbonic acid, ammonium salt, max. 0.5 %, based on the dry fibres weight. The correspondingly treated papers may not come into contact with aqueous and alcoholic foodstuff.
25. Copolymer with 2-diethylaminoethylmethacrylate, 2,2'-ethylendioxydiethylmethacrylate, 2-hydroxyethylmethacrylate and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl methacrylate, acetate and/or malate, max. 1.2 %, based on the dry fibres weight.
26. 2-Propen-1-ol, reaction products with 1,1,1,2,2,3,3,4,4,5,5,6,6- tridecafluoro-6-iodohexane, de-hydroiodinated, reaction products with epichlorohydrin<sup>16</sup> and triethylenetetramine with a fluorine content of 54 %, max. 0.5 %, based on the dry fibres weight
27. Copolymer of acrylic acid, methacrylic acid and polyethylene glycol methylethermono-methacrylate, sodium salt, max. 2.6 mg/dm<sup>2</sup>
28. Copolymer of 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl acrylate, 2-hydroxyethyl acrylate, polyethylene glycol monoacrylate and polyethylene glycol diacrylate with a fluorine content of 35.4 %, max. 0.4 %, based on the dry fibres weight.
29. Copolymer with methacrylic acid, 2-hydroxyethylmethacrylate, polyethylene glycol monoacrylate and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl acrylate, sodium salt with a fluorine content of 45.1 %, max. 0.8 %, based on the dry fibres weight.
30. Copolymer with methacrylic acid, 2-diethylaminoethylmethacrylate, acrylic acid and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl methacrylate, acetate with a fluorine content of 45.1 %, max. 0.6 %, based on the dry fibres weight.

31. Copolymer of methacrylic acid, 2-dimethylaminoethyl methacrylate and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl methacrylate, acetate with a fluorine content of 44.8 %, max. 0.6 %, based on the dry fibres weight.
32. Poly(hexafluoropropylene oxide), polymer with 3-N-methylaminopropylamine, N,N-dimethyl dipropylene triamine and poly(hexamethylene diisocyanate), with a fluorine content of 59.1 %, max. 4 mg/dm<sup>2</sup>
33. Reaction product of hexamethylene-1,6-diisocyanate (homopolymer), converted with 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluoro-1-octanol with a fluorine content of 48 %, max. 0.16 %, based on the dry fibres weight.
34. Coating system consisting of (outside to inside): PVOH with unmodified Na<sup>+</sup>-Bentonite (layer thickness min. 1 µm), LDPE (layer thickness min. 13 µm) and a metallised PE layer (layer thickness min. 14.9 µm). Bentonite may be used, max. 10 % based on the PVOH.
35. Copolymer of 2-dimethylaminoethyl methacrylate and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl methacrylate, N-oxide, acetate, with a fluorine content of 45 %, max. 4 mg/dm<sup>2</sup>
36. Polyethylene waxes, oxidised, max. 10 mg/dm<sup>2</sup>
37. Copolymer of dimethyl terephthalate, ethylene glycol, propane-1,2-diol, pentaerythritol, polyethylene glycol and polyethylene glycol monomethyl ether with a terephthalic acid content of 24 %, max. 0.05 mg/dm<sup>2</sup>
38. Copolymer with 2-hydroxyethylmethacrylate, methacrylic acid, itaconic acid and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl methacrylate, sodium salt, max. 24 mg/dm<sup>2</sup>.
39. Copolymer with 2-hydroxyethylmethacrylate, vinyl pyrrolidone, acrylic acid and 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl acrylate, sodium salt, with a fluorine content of 41.9 %, max. 1.0 %, based on the dry fibres weight
40. Konjac<sup>13</sup>, max. 0.3 %, based on the dry fibres weight
41. Xylitol<sup>12</sup>.
42. Microfibrillated Cellulose formed by grinding of cellulose pulp and a mineral according to section A.II (Fillers), max. 8% Microfibrillated Cellulose by weight based on the dry fibres weight of the paper. The fibre content of the ground mixture is 20-50% by weight. 70-80% of fibril diameters by number are less than 100 nm, the mean fibril diameter by number is 20-40 nm.
43. Sucrose esters of natural fatty acids (C<sub>16</sub> or higher)<sup>12</sup> and/or sucroglycerides of natural fatty acids with (C<sub>16</sub> or higher)<sup>12</sup>, max. 1.5 % based on the dry fibre. The content of sucrose esters with a fatty acid chain length of C<sub>14</sub> or lower must not exceed 1 % in the formulation.
44. Mono- and diglycerides of fatty acids (C<sub>14</sub> or higher)<sup>12</sup>



## Annex to recommendation XXXVI

**Preconditions for the use of recycled fibres as raw materials for the production of paper**

Generally products made from recycled fibres have to comply with all other requirements of recommendation XXXVI.

Substances, such as ingredients of printing inks or adhesives, which can be in the recovered paper used as raw material have to comply with additional requirements. Regarding conformity with the rules of the Good Manufacturing Practice the possible presence of these substances, depending on the use of the papers and boards manufactured from recycled fibers, has to be considered by a careful selection of the grade of recycled paper<sup>35</sup> and the use of suitable cleaning methods.

Moreover, with regards to the compliance with the requirements laid down in article 3 of regulation 1935/2004/EC, particular care has to be taken with the analytics of products with respect to the possible migration of substances of health-concern into foodstuffs. According to the current state of knowledge, known substances which may be introduced by paper recycling and require specific inspections are listed below. Content and migration of these substances into foodstuffs respectively have to comply with the specified limits.

Substance	Content in finished paper	Migration into foodstuff <sup>36</sup>
4,4'-Bis(dimethylamino)-benzophenone*		ND (DL 0.01 mg/kg)
Phthalates Diethylhexyl phthalate Di-n-butyl phthalate Diisobutyl phthalate		Max. 1.5 mg/kg Max. 0.3 mg/kg Max. 0.3 mg/kg The sum of Di-n-butyl phthalate und Diisobutyl phthalate must not exceed 0.3 mg/kg.
Benzophenone		Max. 0.6 mg/kg
Bisphenol A*		Max. 0.05 mg/kg
Bisphenol S*		Max. 0.05 mg/kg
Diisopropyl naphthalene	As low as technically feasible	

\* Verification of the specifications is only required if the finished products are intended for use with moist and fatty foodstuffs.

For dry, non-fatty foodstuffs having a large surface area (e.g. flour, semolina, rice, breakfast cereals, breadcrumbs, sugar and salt), migration of volatile and hydrophobic substances via the gas phase has to be considered particularly. This could be compensated by the use of an appropriate additional packaging.

<sup>35</sup> Exempt are however sort 5.01 (Mixed recovered paper and board; compare European list of standard grades of recovered paper and board, DIN EN 643) and paper and paperboard from sorting plants for general or mixed component waste.

<sup>36</sup> The migration testing can be conducted applying a suitable simulant. If the migration has been determined according to DIN EN 14338, the resulting area related values need to be converted to mg/kg food. The ratio of contact surface and volume of the food upon actual or most adverse usage needs to be considered.