CLAIMS

1. A process for producing polycarbonate comprising:

   a) producing phosgene by reacting chlorine with carbon monoxide;

   b) reacting the phosgene formed in step a) with at least one bisphenol in the presence of an aqueous alkali metal containing base to form a polycarbonate and an alkali metal chloride-containing reaction waste water solution;

   c) separating off and working up the polycarbonate formed in step b) from the alkali metal chloride-containing reaction waste water solution;

   e) distilling at least a portion of the alkali metal chloride-containing reaction waste water solution remaining after step c) via osmotic membrane distillation to obtain an enriched alkali metal chloride-containing solution;

   f) electrochemically oxidating of at least a portion of the alkali metal chloride-containing solution from e) to obtain chlorine, an alkali metal hydroxide solution and, optionally, hydrogen.

2. The process of claim 1, further comprising, in a step d), separating solvent residues and, optionally, catalyst residues (d1) from the alkali metal chloride-containing reaction waste water solution remaining after step c) and subsequently feeding the resulting solution to the osmotic membrane distillation in step e).

3. The process of claim 2, wherein step d) is achieved by extracting or stripping the alkali metal chloride-containing reaction waste water solution with steam and/or subsequently treating the alkali metal chloride-containing reaction waste water solution with an adsorbent (d2).

4. The process of claim 3, wherein the adsorbent (d2) in activated charcoal.

5. The process of claim 2, wherein the osmotic membrane distillation in step e) uses an alkali metal hydroxide solution as a water acceptor.

6. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at a temperature in the range of from 10 to 100 °C.

7. The process of claim 6, wherein the osmotic membrane distillation in step e) is operated at a temperature in the range of from 20 to 50 °C.

8. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at an absolute pressure in the range of from 1.0 to 1.4 bar

9. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at an absolute pressure in the range of from 1.1 to 1.2 bar.

10. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at a differential pressure in the range of from 20 to 150 bar.

11. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at a differential pressure in the range of from 30 to 100 bar.

12. The process of claim 1, wherein the osmotic membrane distillation in step e) uses an an Accurel PP membrane.

13. The process of claim 1, wherein at least a portion of the alkali metal chloride-containing solution obtained in step e) is added to the brine circuit of a membrane electrolysis for producing chlorine, sodium hydroxide solution and, optionally, hydrogen.

14. The process of claim 1, wherein additional alkali metal chloride for increasing the alkali metal chloride concentration is added to the alkali metal chloride-containing solution in the electrolysis in step f).

15. The process of claim 2, wherein, in d1), before treatment with an absorbent (d2), the pH of the alkali metal chloride-containing reaction waste water solution remaining after the separation in step c) is set to below 8.

16. The process of claim 1, wherein the at least one bisphenol is of the general formula

HO-Z-OH

wherein Z is an aromatic moiety havingfrom 6 to 45 carbon atoms, wherein said aromatic moiety optionally contains one or more aromatic rings, is optionally substituted, and optionally contains aliphatic moieties or cycloaliphatic moieties or heteroatoms as bridging units.

17. The process of claim 1, wherein the at least one bisphenol is selected from the group consisting of hydroquinone, resorcinol, dihydroxybiphenyls, bis(hydroxyphenyl)alkanes, bis(hydroxyphenyl)cycloalkanes, bis(hydroxyphenyl) sulphides, bis(hydroxyphenyl) ethers, bis(hydroxyphenyl) ketones, bis(hydroxyphenyl) sulphones, bis(hydroxyphenyl) sulphoxides, α,α'-bis(hydroxyphenyl)diisopropylbenzenes, bis(hydroxyphenyl)phthalimidines, and alkylated, ring-alkylated, and ring-halogenated compounds thereof.

18. The process of claim 1, wherein the at least one bisphenol is selected from the group consisting of 4,4'-dihydroxydiphenyl, 2,2-bis(4-hydroxyphenyl)-1-phenylpropane, 1,1-bis(4-hydroxyphenyl)phenylethane, 2,2-bis(4-hydroxyphenyl)propane, 2,4-bis(4-hydroxyphenyl)-2-methylbutane, 1,3-bis[2-(4-hydroxyphenyl)-2-propyl]benzene, 2,2-bis(3-methyl-4-hydroxyphenyl)propane, bis(3,5-dimethyl-4-hydroxyphenyl)methane, 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane, bis(3,5-dimethyl-4-hydroxyphenyl) sulphone, 2,4-bis(3,5-dimethyl-4-hydroxyphenyl)-2-methylbutane, 1,3-bis[2-(3,5-dimethyl-4-hydroxyphenyl)-2-propyl]benzene, 2-hydrocarbyl-3,3-bis(4-hydroxyphenyl)-phthalimidine, 3,3-bis(4-hydroxyphenyl)-1-phenyl-1H-indol-2-one, 2,2-bis(4-hydroxyphenyl)-1-phenyl-1H-indol-2-one, 3,3-bis(4-hydroxyphenyl)-1-methyl-1H-indol-2-one, 2,2-bis(4-hydroxyphenyl)-1-methyl-1H-indol-2-one, 3,3-bis(4-hydroxyphenyl)-N-methylphthalimidine, 3,3-bis(4-hydroxyphenyl)-N-phenyl-phthalimidine, and 1,1-bis(4-hydroxyphenyl)-3,3,5-trimethylcyclohexane.

19. The process of claim 1, wherein step c) comprises at least the following substeps:

cc) separating an organic phase comprising the polycarbonate-formed in step b) from the alkali metal chloride-containing reaction waste water solution; and

dd) washing the organic phase obtained in step aa) at least once;

wherein at least a portion of the wash phase(s) from bb), optionally after separation of catalyst residues and/or organic solvent residues, is used as a partial substitute of the water for producing the aqueous alkali metal hydroxide solution for use in step b).

20. The process of claim 1, wherein the alkali metal of the alkali metal chloride of the alkali metal chloride-containing reaction waste water solution is sodium.

CLAIMS

1. A process for producing polycarbonate comprising:

a) producing phosgene by reacting chlorine with carbon monoxide;

b) reacting the phosgene formed in step a) with at least one bisphenol in the presence of an aqueous alkali metal containing base to form a polycarbonate and an alkali metal chloride-containing reaction waste water solution;

c) separating off and working up the polycarbonate formed in step b) from the alkali metal chloride-containing reaction waste water solution;

e) distilling at least a portion of the alkali metal chloride-containing reaction waste water solution remaining after step c) via osmotic membrane distillation to obtain an enriched alkali metal chloride-containing solution;

f) electrochemically oxidating of at least a portion of the alkali metal chloride-containing solution from e) to obtain chlorine, an alkali metal hydroxide solution and, optionally, hydrogen.

2. The process of claim 1, further comprising, in a step d), separating solvent residues and, optionally, catalyst residues (d1) from the alkali metal chloride-containing reaction waste water solution remaining after step c) and subsequently feeding the resulting solution to the osmotic membrane distillation in step e).

3. The process of claim 2, wherein step d) is achieved by extracting or stripping the alkali metal chloride-containing reaction waste water solution with steam and/or subsequently treating the alkali metal chloride-containing reaction waste water solution with an adsorbent (d2).

4. The process of claim 3, wherein the adsorbent (d2) in activated charcoal.

5. The process of claim 2, wherein the osmotic membrane distillation in step e) uses an alkali metal hydroxide solution as a water acceptor.

6. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at a temperature in the range of from 10 to 100° C.

7. The process of claim 6, wherein the osmotic membrane distillation in step e) is operated at a temperature in the range of from 20 to 50° C.

8. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at an

absolute pressure in the range of from 1.0 to 1.4 bar.

9. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at an absolute pressure in the range of from 1.1 to 1.2 bar.

10. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at a differential pressure in the range of from 20 to 150 bar.

11. The process of claim 1, wherein the osmotic membrane distillation in step e) is operated at a differential pressure in the range of from 30 to 100 bar.

12. The process of claim 1, wherein the osmotic membrane distillation in step e) uses an an Accurel PP membrane.

13. The process of claim 1, wherein at least a portion of the alkali metal chloride-containing solution obtained in step e) is added to the brine circuit of a membrane electrolysis for producing chlorine, sodium hydroxide solution and, optionally, hydrogen.

14. The process of claim 1, wherein additional alkali metal chloride for increasing the alkali metal chloride concentration is added to the alkali metal chloride-containing solution in the electrolysis in step f).

15. The process of claim 2, wherein, in d1), before treatment with an absorbent (d2), the pH of the alkali metal chloride-containing reaction waste water solution remaining after the separation in step c) is set to below 8.

16. The process of claim 1, wherein the at least one bisphenol is of the general formula

HO—Z—OH

wherein Z is an aromatic moiety having from 6 to 45 carbon atoms, wherein said aromatic moiety optionally contains one or more aromatic rings, is optionally substituted, and optionally contains aliphatic moieties or cycloaliphatic moieties or heteroatoms as bridging units.

17. The process of claim 1, wherein the at least one bisphenol is selected from the group consisting of hydroquinone, resorcinol, dihydroxybiphenyls, bis(hydroxyphenyl)alkanes, bis(hydroxyphenyl)cycloalkanes, bis(hydroxyphenyl)sulphides, bis(hydroxyphenyl)ethers, bis(hydroxyphenyl)ketones, bis(hydroxyphenyl)sulphones, bis(hydroxyphenyl)sulphoxides, α,α'-

bis(hydroxyphenyl)diisopropylbenzenes, bis(hydroxyphenyl)phthalimidines, and alkylated, ring-alkylated, and ring-halogenated compounds thereof.

18. The process of claim 1, wherein the at least one bisphenol is selected from the group consisting of 4,4'-dihydroxydiphenyl, 2,2-bis(4-hydroxyphenyl)-1-phenylpropane, 1,1-bis(4-hydroxyphenyl)phenylethane, 2,2-bis(4-hydroxy-phenyl)propane, 2,4-bis(4-hydroxyphenyl)-2-methylbutane, 1,3-bis[2-(4-hydroxyphenyl)-2-propyl]benzene, 2,2-bis(3-methyl-4-hydroxyphenyl)propane, bis(3,5-dimethyl-4-hydroxyphenyemethane, 2,2-bis(3,5-dimethyl-4-hydroxyphenyl)propane, bis(3,5-dimethyl-4-hydroxyphenyl)sulphone, 2,4-bis(3,5-dimethyl-4-hydroxyphenyl)-2-methylbutane, 1,3-bis[2-(3,5-dimethyl-4-hydroxyphenyl)-2-propyl]benzene, 2-hydrocarbyl-3,3-bis(4-hydroxyphenyl)-phthalimidine, 3,3-bis(4-hydroxyphenyl)-1-phenyl-1H-indol-2-one, 2,2-bis(4-hydroxyphenyl)-1-phenyl-1H-indol-2-one, 3,3-bis(4-hydroxyphenyl)-1-methyl-1H-indol-2-one, 2,2-bis(4-hydroxyphenyl)-1-methyl-1H-indol-2-one, 3,3-bis(4-hydroxyphenyl)-N-methylphthalimidine, 3,3-bis(4-hydroxyphenyl)-N-phenyl-phthalimidine, and 1,1-bis(4-hydroxyphenyl)-3,3,5-trimethylcyclohexane.

19. The process of claim 1, wherein step c) comprises at least the following substeps:

cc) separating an organic phase comprising the polycarbonate-formed in step b) from the alkali metal chloride-containing reaction waste water solution; and

dd) washing the organic phase obtained in step aa) at least once;

wherein at least a portion of the wash phase(s) from bb), optionally after separation of catalyst residues and/or organic solvent residues, is used as a partial substitute of the water for producing the aqueous alkali metal hydroxide solution for use in step b).

20. The process of claim 1, wherein the alkali metal of the alkali metal chloride of the alkali metal chloride-containing reaction waste water solution is sodium.