Claims

1. Process for the preparation of polyethercarbonate polyols, characterized in that

(i) in a first step a polyethercarbonate polyol is prepared from one or more H-functional starter substances, one or more alkylene oxides and carbon dioxide in the presence of at least one DMC catalyst, and

(ii) in a second step the polyethercarbonate polyol chain is extended with a mixture of at least two different alkylene oxides in the presence of at least one DMC catalyst,

and in that the mixture of at least two different alkylene oxides used in the second step (ii) is a mixture comprising propylene oxide (PO) and ethylene oxide (EO) in a molar ratio PO/EO of 15/85 to 60/40.

2. Process according to Claim 1, characterized in that, in the first step (i),

(α) the H-functional starter substance or a mixture of at least two H-functional starter substances is taken and optionally water and/or other highly volatile compounds are removed by raising the temperature and/or reducing the pressure ("drying"), the DMC catalyst being added to the H-functional starter substance or the mixture of at least two H-functional starter substances before or after drying,

(β) for activation, a fraction (based on the total amount of alkylene oxides used in the activation and copolymerization) of one or more alkylene oxides is added to the mixture resulting from step (α), it optionally being possible for this addition of an alkylene oxide fraction to take place in the presence of CO_2, the hotspot that occurs due to the subsequent exothermic chemical reaction and/or a pressure drop in the reactor then being allowed to subside, and it also being possible for the activation step (β) to be carried out several times, and

(γ) one or more alkylene oxides and carbon dioxide are added to the mixture resulting from step (β), it being possible for the alkylene

oxides used in step (γ) to be identical to or different from the alkylene oxides used in step (β).

3. Process according to Claim 1 or 2, characterized in that the mixture of at least two different alkylene oxides used in the second step (ii) is a mixture consisting of propylene oxide (PO) and ethylene oxide (EO) in a molar ratio PO/EO of 15/85 to 60/40.

4. Process according to one of Claims 1 to 3, characterized in that, in the second step (ii), the molar ratio of propylene oxide (PO) to ethylene oxide (EO) is from 15/85 to 40/60.

5. Process according to one of Claims 1 to 4, characterized in that

(iii) the chain of the polyethercarbonate polyol with terminal mixed block, resulting from step (ii), is extended with an alkylene oxide.

6. Polyethercarbonate polyol comprising a terminal mixed block of at least two alkylene oxides, characterized in that the terminal mixed block comprises a mixture of propylene oxide (PO) and ethylene oxide (EO) in a molar ratio PO/EO of 15/85 to 60/40.

7. Polyethercarbonate polyol according to Claim 6, characterized in that the terminal mixed block consists of a mixture of propylene oxide (PO) and ethylene oxide (EO) in a molar ratio PO/EO of 15/85 to 60/40.

8. Polyethercarbonate polyol according to Claim 6 or 7, characterized in that the molar ratio of propylene oxide (PO) to ethylene oxide (EO) in the mixed block is from 15/85 to 40/60.

9. Polyethercarbonate polyol according to one of Claims 6 to 8, characterized in that the chain of the terminal mixed block is extended with an alkylene oxide.

10. Polyethercarbonate polyol according to one of Claims 6 to 9, characterized in that the mean length of the terminal mixed block of at least two different alkylene oxides is from 2.0 to 20.0 alkylene oxide units.

11. Process for the production of flexible polyurethane foams wherein a polyol component (component A) is used which comprises a polyethercarbonate polyol according to one of Claims 6 to 10.

12. Process for the production of flexible polyurethane foams with a gross density according to DIN EN ISO 3386-1-98 in the range from ≥ 10 kg/m^3 to ≤ 150 kg/m^3 and a compressive strength according to DIN EN ISO 3386-1-98 in the range from ≥ 0.5 kPa to ≤ 20 kPa (at 40% deformation after 4th cycle) by reacting

component A comprising

A1 100 to 10 parts by weight (based on the sum of the parts by weight of components A1 and A2) of polyethercarbonate polyol according to one of Claims 6 to 10,

A2 0 to 90 parts by weight (based on the sum of the parts by weight of components A1 and A2) of conventional polyether polyol,

A3 0.5 to 25 parts by weight (based on the sum of the parts by weight of components A1 and A2) of water and/or physical blowing agents,

A4 0.05 to 10 parts by weight (based on the sum of the parts by weight of components A1 and A2) of auxiliary substances and additives such as

d) catalysts,

e) surface-active additives and

f) pigments or flame retardants, and

A5 0 to 10 parts by weight (based on the sum of the parts by weight of components A1 and A2) of compounds having isocyanate-reactive hydrogen atoms with a molecular weight of 62 – 399,

with component B comprising polyisocyanates,

the preparation taking place at an index of 50 to 250, and all the parts by weight of components A1 to A5 in the present patent application being scaled so that the sum of the parts by weight of components A1+A2 in the composition is 100.

13. Process according to Claim 12 wherein a component A consisting of

A1 100 parts by weight of polyethercarbonate polyol according to one of Claims 6 to 10,

A2 0 parts by weight of conventional polyether polyol,

A3 0.5 to 25 parts by weight (based on the parts by weight of component A1) of water and/or physical blowing agents,

A4 0.05 to 10 parts by weight (based on the parts by weight of component A1) of auxiliary substances and additives such as

g) catalysts,

h) surface-active additives and

i) pigments or flame retardants, and

A5 0 to 10 parts by weight (based on the parts by weight of component A1) of compounds having isocyanate-reactive hydrogen atoms with a molecular weight of 62 – 399

is used.

14. Process for the production of flexible polyurethane foams wherein a polyol component (component A) is used which comprises a polyethercarbonate polyol obtainable according to one of Claims 1 to 5.

15. Flexible polyurethane foams with a gross density according to DIN EN ISO 3386-1-98 in the range from ≥ 10 kg/m^3 to ≤ 150 kg/m^3 and a compressive strength according to DIN EN ISO 3386-1-98 in the range from ≥ 0.5 kPa to ≤ 20 kPa (at 40% deformation after 4th cycle), obtainable by a process according to one of Claims 11 to 14.

Claims

1. Process for the preparation of polyethercarbonate polyols, characterized in that

   (i) in a first step a polyethercarbonate polyol is prepared from one or more H-functional starter substances, one or more alkylene oxides and carbon dioxide in the presence of at least one DMC catalyst, and

   (ii) in a second step the polyethercarbonate polyol chain is extended with a mixture of at least two different alkylene oxides in the presence of at least one DMC catalyst,

   and in that the mixture of at least two different alkylene oxides used in the second step (ii) is a mixture comprising propylene oxide (PO) and ethylene oxide (EO) in a molar ratio PO/EO of 15/85 to 60/40.

2. Process according to Claim 1, characterized in that, in the first step (i),

   (α) the H-functional starter substance or a mixture of at least two H-functional starter substances is taken and optionally water and/or other highly volatile compounds are removed by raising the temperature and/or reducing the pressure ("drying"), the DMC catalyst being added to the H-functional starter substance or the mixture of at least two H-functional starter substances before or after drying,

   (β) for activation, a fraction (based on the total amount of alkylene oxides used in the activation and copolymerization) of one or more alkylene oxides is added to the mixture resulting from step (α), it optionally being possible for this addition of an alkylene oxide fraction to take place in the presence of CO_2, the hotspot that occurs due to the subsequent exothermic chemical reaction and/or a pressure drop in the reactor then being allowed to subside, and it also being possible for the activation step (β) to be carried out several times, and

   (γ) one or more alkylene oxides and carbon dioxide are added to the mixture resulting from step (β), it being possible for the alkylene

oxides used in step (γ) to be identical to or different from the alkylene oxides used in step (β).

3. Process according to Claim 1 or 2, characterized in that, in the second step (ii), the molar ratio of propylene oxide (PO) to ethylene oxide (EO) is from 15/85 to 40/60.

4. Process according to one of Claims 1 to 3, characterized in that

(iii) the chain of the polyethercarbonate polyol with terminal mixed block, resulting from step (ii), is extended with an alkylene oxide.

5. Polyethercarbonate polyol comprising a terminal mixed block of at least two alkylene oxides, characterized in that the terminal mixed block comprises a mixture of propylene oxide (PO) and ethylene oxide (EO) in a molar ratio PO/EO of 15/85 to 60/40.

6. Polyethercarbonate polyol according to Claim 5, characterized in that the molar ratio of propylene oxide (PO) to ethylene oxide (EO) in the mixed block is from 15/85 to 40/60.

7. Polyethercarbonate polyol according Claim 5 or 6, characterized in that the chain of the terminal mixed block is extended with an alkylene oxide.

8. Polyethercarbonate polyol according to one of Claims 5 to 7, characterized in that the mean length of the terminal mixed block of at least two different alkylene oxides is from 2.0 to 20.0 alkylene oxide units.

9. Process for the production of flexible polyurethane foams wherein a polyol component (component A) is used which comprises a polyethercarbonate polyol according to one of Claims 5 to 8.

10. Process according to claim 9 for the production of flexible polyurethane foams with a gross density according to DIN EN ISO 3386-1-98 in the range from $\geq$10 kg/m^3 to $\leq$150 kg/m^3 and a compressive strength according to DIN EN ISO 3386-1-98 in the range from $\geq$0.5 kPa to $\leq$20 kPa (at 40% deformation after 4th cycle) by reacting

component A comprising

A1 100 to 10 parts by weight (based on the sum of the parts by weight of components A1 and A2) of polyethercarbonate polyol according to one of Claims 5 to 8,

A2 0 to 90 parts by weight (based on the sum of the parts by weight of components A1 and A2) of conventional polyether polyol,

A3 0.5 to 25 parts by weight (based on the sum of the parts by weight of components A1 and A2) of water and/or physical blowing agents,

A4 0.05 to 10 parts by weight (based on the sum of the parts by weight of components A1 and A2) of auxiliary substances and additives such as

d) catalysts,

e) surface-active additives and

f) pigments or flame retardants, and

A5 0 to 10 parts by weight (based on the sum of the parts by weight of components A1 and A2) of compounds having isocyanate-reactive hydrogen atoms with a molecular weight of 62 – 399,

with component B comprising polyisocyanates,

the preparation taking place at an index of 50 to 250, and all the parts by weight of components A1 to A5 in the present patent application being scaled so that the sum of the parts by weight of components A1+A2 in the composition is 100.

11. Process according to Claim 10 wherein a component A consisting of

A1 100 parts by weight of polyethercarbonate polyol according to one of Claims 5 to 8,

A2 0 parts by weight of conventional polyether polyol,

A3 0.5 to 25 parts by weight (based on the parts by weight of component A1) of water and/or physical blowing agents,

A4 0.05 to 10 parts by weight (based on the parts by weight of component A1) of auxiliary substances and additives such as

g) catalysts,

h) surface-active additives and

i) pigments or flame retardants, and

A5 0 to 10 parts by weight (based on the parts by weight of component A1) of compounds having isocyanate-reactive hydrogen atoms with a molecular weight of 62 – 399

is used.

12. Flexible polyurethane foams with a gross density according to DIN EN ISO 3386-1-98 in the range from $\geq$10 kg/m^3 to $\leq$150 kg/m^3 and a compressive strength according to DIN EN ISO 3386-1-98 in the range from $\geq$0.5 kPa to $\leq$ 20 kPa (at 40% deformation after 4th cycle), obtainable by a process according to one of Claims 9 to 11.