Claims

1. A process for preparing polyoxymethylene block copolymers by catalytic addition of alkylene oxides and optionally further comonomers onto at least one polymeric formaldehyde starter compound having at least one terminal hydroxyl group, in the presence of a double metal cyanide (DMC) catalyst, wherein

   (i) in a first step the DMC catalyst is activated in the presence of the polymeric formaldehyde starter compound, activation of the DMC catalyst being accomplished by adding a portion (based on the totality of the amount of alkylene oxides used in the activation and polymerization) of one or more alkylene oxides,

   (ii) in a second step one or more alkylene oxides and optionally further comonomers are added to the mixture resulting from step (i), where the alkylene oxides used in step (ii) may be the same as or different than the alkylene oxides used in step (i),

   characterized in that the activation of the DMC catalyst in the first step (i) is effected at an activation temperature (T_{act}) of 20 to 120°C.

2. The process as claimed in claim 1, wherein at least one open-chain polymeric formaldehyde starter compound having n repeat oxymethylene units and a functionality F of 1 to 10, especially a linear formaldehyde starter compound of the general formula HO-$(CH_2O)_n$-H having two terminal hydroxyl groups, is used, where n is an integer of n = 2 to 400, especially 8 to 100, and wherein the starter compound may especially also take the form of a mixture of polymeric formaldehyde starter compounds each having different values of n.

3. The process as claimed in claim 1 or 2, wherein paraformaldehyde is used as polymeric formaldehyde starter compound.

4. The process as claimed in any of the preceding claims, wherein the amount of one or more alkylene oxides used in step (i) is 2 to 100 molar equivalents based on the amount of polymeric formaldehyde starter compound used.

5. The process as claimed in any of the preceding claims, wherein carbon dioxide is added as comonomer in step (ii).

6. The process as claimed in any of the preceding claims, wherein

   in the first step (i)

(α) a suspension medium or the polymeric formaldehyde starter compound is initially charged and, optionally, water and/or other volatile compounds are removed by means of elevated temperature and/or reduced pressure, the DMC catalyst being added to the polymeric formaldehyde starter compound or to the suspension medium before or after the drying,

(β) activation of the DMC catalyst in the presence of the polymeric formaldehyde starter compound is accomplished by adding a portion (based on the entirety of the amount of alkylene oxides used in the activation and polymerization) of one or more alkylene oxides to the mixture resulting from step (α), where this portion of alkylene oxide may optionally be added in the presence of further comonomers such as CO_2 in particular and where the temperature spike ("hotspot") which occurs due to the exothermic chemical reaction that follows and/or a pressure drop in the reactor is then awaited in each case, and where step (β) for activation may also be repeated,

and in the second step (ii)

(γ) one or more alkylene oxides and optionally further comonomers, especially carbon dioxide, are added to the mixture resulting from step (β), where the alkylene oxides used in step (γ) may be the same as or different than the alkylene oxides used in step (β),

wherein at least one polymeric formaldehyde starter compound is added at least in one of steps (α) and (β).

7. The process as claimed in claim 6, wherein the polymerization in step (γ) is conducted at a temperature of 70 to 140°C.

8. The process as claimed in claim 6 or 7, wherein the suspension medium used in step (α) is at least one compound selected from the group consisting of 4-methyl-2-oxo-1,3-dioxolane, 1,3-dioxolan-2-one, acetone, methyl ethyl ketone, acetonitrile, nitromethane, dimethyl sulfoxide, sulfolane, dimethylformamide, dimethylacetamide, N-methylpyrrolidone, dioxane, diethyl ether, methyl tert-butyl ether, tetrahydrofuran, ethyl acetate, butyl acetate, pentane, n-hexane, benzene, toluene, xylene, ethylbenzene, chloroform, chlorobenzene, dichlorobenzene and carbon tetrachloride.

9. The process as claimed in any of claims 6 to 8, wherein, in step (α),

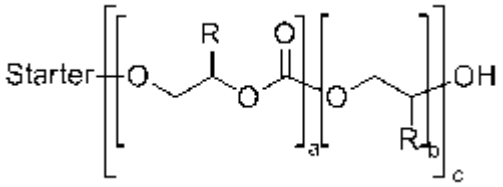
(α1) a suspension medium and the DMC catalyst are initially charged and water and/or other volatile compounds are removed by, at a temperature of 90 to 150°C, injecting

an inert gas at 1 bar to 100 bar (absolute) at least once, preferably three times, and each time subsequently reducing the elevated pressure to about 1 bar to 20 bar (absolute)

and, in a subsequent step,

(α2) the formaldehyde starter compound is added to the mixture from step (α1).

10. A polyoxymethylene-polyoxyalkylene carbonate block copolymer comprising an inner polyoxymethylene block ("starter") and at least one outer polyoxyalkylene carbonate block of formula (II)



(II)

where R is an organic radical such as alkyl, alkylaryl, arylalkyl or aryl, each of which may also contain heteroatoms, for example O, S, Si, etc.,

and where a, b and c are each an integer and R may differ in different repeat units,

and where the structural unit "starter" represents a polyoxymethylene block deriving from the polymeric formaldehyde starter compound.

11. A polyurethane polymer obtainable by reacting a di-, tri- and/or polyisocyanate with at least one polyoxymethylene block copolymer as claimed in claim 10.

12. A flexible polyurethane foam or rigid polyurethane foam obtainable by reacting a di-, tri- and/or polyisocyanate with at least one polyoxymethylene block copolymer as claimed in claim 10.

13. The use of polyoxymethylene block copolymers as claimed in claim 10 for production of polyurethanes, washing and cleaning composition formulations, drilling fluids, fuel additives, ionic and nonionic surfactants, lubricants, process chemicals for papermaking or textile production, or cosmetic formulations.