Claims

1. A process for the preparation of propylene oxide, comprising
   (i) providing a reaction mixture comprising propylene, water, organic solvent, and hydrogen peroxide;
   (ii) contacting the reaction mixture provided in (i) in an epoxidation zone with an epoxidation catalyst comprising a zeolitic material having a framework structure comprising Si, O, and Ti, and subjecting the reaction mixture to epoxidation reaction conditions in the epoxidation zone, obtaining, in the epoxidation zone, a mixture comprising propylene oxide, water, and organic solvent;
   (iii) removing an effluent stream from the epoxidation zone, the effluent stream comprising propylene oxide, water, and organic solvent;
   wherein the reaction mixture provided in (i) and subjected to (ii) contains in an amount of at most 500 mg per kg hydrogen peroxide comprised in said reaction mixture at least one aliphatic oxygen containing compound having 8 to 10 carbon atoms;
   wherein the at least one aliphatic oxygen containing compound having 8 to 10 carbon atoms is selected from the group consisting of secondary mono alcohols C9H20O, mono ketones C9H18O, and mixtures of secondary mono alcohols C9H20O and mono ketones C9H18O;
   comprises at least diisobutyl carbinol;
   wherein the organic solvent comprises at least an alcohol;
   wherein the organic solvent is an alcohol which comprises methanol;
   wherein the organic solvent is methanol;
   and wherein the material having a framework structure comprising Si, 0, and Ti is a titanium silicalite-1 (TS-1).

2. The process of claim 1, wherein the reaction mixture provided in (i) and subjected to (ii) contains the at least one aliphatic oxygen containing compound having 8 to 10 carbon atoms in an amount in the range from 0 to 500 mg per kg hydrogen peroxide comprised in the reaction mixture, preferably in the range from 0 to 400 mg per kg hydrogen peroxide comprised in the reaction mixture, more preferably in the range from 0 to 300 mg per kg hydrogen peroxide comprised in the reaction mixture, more preferably in the range from 0 to 200 mg per kg hydrogen peroxide comprised in the reaction mixture, more preferably in the range from 0 to 100 mg per kg hydrogen peroxide comprised in the reaction mixture.

3. The process of any one of claim 1 or 2, wherein providing the reaction mixture in (i) comprises
   (i.1) providing an aqueous hydrogen peroxide solution;
   (i.2) admixing the aqueous hydrogen peroxide solution provided in (i.1) with propylene and organic solvent, obtaining the reaction mixture;

wherein the aqueous hydrogen peroxide solution provided in (i.1) and subjected to (i.2) contains the at least one aliphatic oxygen containing compound having 8 to 10 carbon atoms in an amount of at most 500 mg per kg hydrogen peroxide comprised in the reaction mixture.

4. The process of claim 3, wherein the aqueous hydrogen peroxide solution provided in (i.1) and subjected to (i.2) contains the at least one aliphatic oxygen containing compound having 8 to 10 carbon atoms in an amount in the range from 0 to 500 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution, preferably in the range from 0 to 400 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution, more preferably in the range from 0 to 300 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution, more preferably in the range from 0 to 200 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution, more preferably in the range from 0 to 100 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution.

5. The process of claim 3 or 4, wherein the aqueous hydrogen peroxide solution provided in (i.1) and subjected to (i.2) has a total organic carbon content (TOC) in the range from 100 to 800 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution, preferably in the range from 120 to 750 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution, more preferably in the range from150 to 700 mg per kg hydrogen peroxide comprised in the aqueous hydrogen peroxide solution, determined as described in Reference Example 5.

6. The process of any one of claims 3 to 5, wherein the aqueous hydrogen peroxide solution provided in (i.1) and subjected to (i.2) is obtained or obtainable from an anthraquinone process.

7. The process of any one of claims 1 to 6, wherein the epoxidation reaction conditions according to (ii) comprise trickle-bed conditions or wherein the epoxidation reaction conditions according to (ii) comprise fixed-bed conditions.

8. The process of any one of claims 1 to 7, wherein at least (ii) is carried out continuously, wherein preferably at least (ii) and (iii), more preferably (i), (ii) and (iii) are carried out continuously.

9. A reaction mixture for preparing propylene oxide, comprising propylene, water, organic solvent, and hydrogen peroxide, wherein the reaction mixture comprises at least one aliphatic oxygen containing compound having 8 to 10 carbon atoms in an amount of at most 500 mg per kg hydrogen peroxide comprised in the reaction mixture;
wherein the at least one aliphatic oxygen containing compound having 8 to 10 carbon atoms is selected from the group consisting of secondary mono alcohols C9H20O,

mono ketones C9H18O, and mixtures of secondary mono alcohols C9H20O and mono ketones C9H18O; and
comprises at least diisobutyl carbinol.

10. The reaction mixture of claim 9, being obtainable or obtained by a process comprising, preferably consisting of (i) as defined in any one of claims 1 to 9.

11. A catalytic epoxidation system for preparing propylene oxide, the catalytic epoxidation system comprising an epoxidation catalyst comprising a zeolitic material having a framework structure comprising Si, O, and Ti, and further comprising the reaction mixture comprising propylene, water, and organic solvent according to claim 9 or 10.