be phosphate, carbonate, bicarbonate, carboxylates, citrate, borate, hydroxide, silicate, aluminosilicate, or the like, and the cation may be ammonium, alkylammoniums, alkali metals, alkaline earth metals, or the like. The addition of buffers is however not suggested by the examples.

WO 2012/157473 A1 relates to a method for producing a titanosilicate-containing catalyst and a method for epoxidizing an olefin with hydrogen peroxide by a catalytic reaction with said catalyst. Also in this process, a buffering agent may be employed, which is hower not supported by the examples.

It was an object of the embodiments disclosed herein to provide an improved continuous process for the epoxidation of propene with hydrogen peroxide as oxidizing agent in the presence of a catalyst containing a titanium zeolite of framework structure type MWW and in the presence of acetonitrile as solvent.

It was a further object of the embodiments disclosed herein to provide a catalytic system which exhibits an excellent long-time stability, in particular in terms of propylene oxide selectivity.

Surprisingly, it was found that these objects can be solved if in the continuous reaction, a specific titanium zeolite of framework structure type MWW is employed as epoxidation catalyst and a liquid feed stream to be fed into the epoxidation reactor is provided which comprises propene, hydrogen peroxide, acetonitrile, water, and at least one dissolved potassium salt which has a specific molar ratio of potassium relative to phosphorus.

Therefore, the present disclosure relates to a continuous process for the preparation of propylene oxide, comprising

(i) providing a liquid feed stream comprising propene, hydrogen peroxide, acetonitrile, water, optionally propane, and at least one dissolved potassium salt of a phosphorus oxyacid;

(ii) passing the liquid feed stream provided in (i) into an epoxidation reactor comprising a catalyst comprising a titanium zeolite of structure type MWW comprising zinc, and subjecting the liquid feed stream to epoxidation reaction conditions in the epoxidation reactor, obtaining a reaction mixture comprising propylene oxide, acetonitrile, water, the at least one dissolved potassium salt of a phosphorus oxyacid, optionally propene, and optionally propane;

(iii) removing an effluent stream from the epoxidation reactor, the effluent stream comprising propylene oxide, acetonitrile, water, at least a portion of the at least one

dissolved potassium salt of a phosphorus oxyacid, optionally propene, and optionally propane;

wherein the molar ratio of potassium relative to phosphorus in the at least one potassium salt of a phosphorus oxyacid is in the range of from 0.6 to 1.4.

A continuous process for the preparation of propylene oxide, comprising

(i) providing a liquid feed stream comprising propene, hydrogen peroxide, acetonitrile, water, optionally propane, and at least one dissolved potassium salt of a phosphorus oxyacid;

(ii) passing the liquid feed stream provided in (i) into an epoxidation reactor comprising a catalyst comprising a titanium zeolite of structure MWW comprising zinc, and subjecting the liquid feed stream to epoxidation reaction conditions in the epoxidation reactor, obtaining a reaction mixture comprising propylene oxide, acetonitrile, water, the at least one dissolved potassium salt of a phosphorus oxyacid, optionally propene, and optionally propane;

(iii) removing an effluent stream from the epoxidation reactor, the effluent stream comprising propylene oxide, acetonitrile, water, at least a portion of the at least one dissolved potassium salt of a phosphorus oxyacid, optionally propene, and optionally propane;

wherein a molar ratio of potassium relative to phosphorus in the at least one potassium salt of a phosphorus oxyacid is in a range of from 0.6 to 1.4.

Further, the present disclosure relates to a catalytic system comprising a catalyst comprising a titanium zeolite of structure type MWW comprising zinc, and comprising at least one potassium salt of a phosphorus oxyacid, wherein the molar ratio of potassium relative to phosphorus in the potassium salt of the at least one phosphorus oxyacid is in the range of from 0.6 to 1.4.

Yet further, the present disclosure relates to a use of at least one potassium salt of a phosphorus oxyacid wherein the molar ratio of potassium relative to phosphorus in the potassium salt of the at least one phosphorus oxyacid is in the range of from 0.6 to 1.4 as an additive for a titanium zeolite of framework structure type MWW comprising zinc in a preferably continuous process for the preparation of propylene oxide.

Step (i)

According to step (i) of the process of the present invention, the provided stream comprises at least one dissolved potassium salt of a phosphorus oxyacid wherein the molar ratio of potassium relative to phosphorus in the at least one potassium salt of the phosphorus oxyacid is in the range of from 0.6 to 1.4. The term "at least one dissolved potassium salt of a

phosphorus oxyacid" as used in this context of the present invention either relates to one potassium salt of a phosphorus oxyacid which, dissolved in the liquid feed stream, meets the requirement of the molar ratio of potassium relative to phosphorus in the range of from 0.6 to 1.4. In this case, if the oxyacid is, for instance, H_3PO_4, it is possible, for example, to prepare a liquid feed with a molar ratio of potassium relative to phosphorus other than 1 by suitably providing a mixture of KH_2PO_4 and H_3PO_4. The term "at least one dissolved potassium salt of a phosphorus oxyacid" also relates to two or more potassium salts wherein a first potassium salt can be the salt of a first phosphorus oxyacid and a second potassium salt can be the salt of a second phosphorus oxyacid which is different from the first phosphorus oxyacid. If two or more dissolved potassium salts are employed, it is the total molar amount of potassium of the dissolved salts relative to the total molar amount of phosphorus of the dissolved salts which defines the molar ratio of potassium relative to phosphorus in the range of from 0.6 to 1.4. Also in this case where two or more potassium salts are employed, it is possible to prepare a liquid feed with a molar ratio of potassium relative to phosphorus within the defined range by suitably providing a mixture of the two or more potassium salts and the

Claims

1. A continuous process for the preparation of propylene oxide, comprising
   (i) providing a liquid feed stream comprising propene, hydrogen peroxide, acetonitrile, water, optionally propane, and at least one dissolved potassium salt of a phosphorus oxyacid;
   (ii) passing the liquid feed stream provided in (i) into an epoxidation reactor comprising a catalyst comprising a titanium zeolite of structure MWW comprising zinc, and subjecting the liquid feed stream to epoxidation reaction conditions in the epoxidation reactor, obtaining a reaction mixture comprising propylene oxide, acetonitrile, water, the at least one dissolved potassium salt of a phosphorus oxyacid, optionally propene, and optionally propane;
   (iii) removing an effluent stream from the epoxidation reactor, the effluent stream comprising propylene oxide, acetonitrile, water, at least a portion of the at least one dissolved potassium salt of a phosphorus oxyacid, optionally propene, and optionally propane;
   wherein a molar ratio of potassium relative to phosphorus in the at least one potassium salt of a phosphorus oxyacid is in a range of from 0.6 to 1.4.

2. The process of claim 1, wherein the at least one potassium salt of a phosphorus oxyacid has the following formula (I)

$$K_{nx}H_{2+n(1-x)}P_nO_{3n+1} \quad (I)$$

   wherein n is an integer in a range of from 1 to 10, and wherein x is in a range of from 0.6 to 1.4.

3. The process of claim 2, wherein n is 1.

4. The process of claim 2, wherein x is in a range of from 0.95 to 1.05.

5. The process of claim 1, wherein a weight ratio of water relative to acetonitrile in the liquid feed stream provided in (i) is at most 1:4.

6. The process of claim 1, wherein a molar ratio of potassium comprised in the at least one potassium salt of a phosphorus oxyacid relative to hydrogen peroxide in the liquid feed stream provided in (i) is in a range of from $25x10^{-6}$:1 to $250x10^{-6}$:1.

7. The process of claim 1, wherein the liquid feed stream provided in (i) contains ammonium NH_4^+ in an amount of at most 2 weight-ppm.

8. The process of claim 1, wherein the liquid feed stream provided in (i) contains sodium in a molar ratio of sodium relative to hydrogen peroxide in a range of from $1x10^{-6}$:1 to $250x10^{-6}$:1.

9. The process of claim 1, wherein the liquid feed stream provided in (i) comprises
acetonitrile in an amount of from 60 to 75 weight-% based on a total weight of the liquid feed stream;
hydrogen peroxide in an amount of from 6 to 10 weight-% based on the total weight of the liquid feed stream;
propene with a molar ratio of propene relative to hydrogen peroxide comprised in the liquid feed stream in a range of from 1:1 to 1.5:1; and
optionally propane with a molar ratio of propane relative to a sum of propene and propane in a range of from 0.0001:1 to 0.15:1;
wherein at least 95 weight-% of the liquid feed stream provided in (i) consist of propene, hydrogen peroxide, acetonitrile, water, the at least one dissolved potassium salt of a phosphorus oxyacid, and optionally propane.

10. The process of claim 1, wherein the titanium zeolite of framework structure MWW comprising zinc comprised in the catalyst in (ii) contains titanium, calculated as elemental titanium, in an amount of from 0.1 to 5 weight-%, based on a total weight of the titanium zeolite of framework structure MWW comprising zinc, and contains zinc, calculated as elemental zinc, in an amount of from 0.1 to 5 weight-%, based on the total weight of the titanium zeolite of framework structure MWW comprising zinc.

11. The process of claim 1, wherein a propylene oxide selectivity of the epoxidation reaction according to (ii) is at least 95 % wherein the propylene oxide selectivity is defined as a molar amount of propylene oxide comprised in the effluent stream removed in (iii) relative to a molar amount of hydrogen peroxide comprised in the liquid feed stream provided in (i).

12. The process of claim 1, wherein the effluent stream removed in (iii) comprises propene, optionally propane, and optionally oxygen, the process further comprising

(iv) separating propene, optionally together with propane and oxygen, from the effluent stream, obtaining a stream S01 enriched in propylene oxide, acetonitrile, and water;

(v) separating propylene oxide from S01, obtaining a stream comprising propylene oxide and being depleted of acetonitrile and water.