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 present ~~invention~~ disclosure 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 present ~~invention~~ disclosure 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 ~~invention~~ 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.

Further, the present ~~invention~~ 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.

In an aspect, there is provided a catalytic system comprising a catalyst comprising a titanium zeolite of structure type MWW comprising zinc and at least one potassium salt of a phosphorus oxyacid, 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, and wherein if two or more potassium salts are employed, the molar ratio of potassium relative to phosphorus is defined by the total molar amount of potassium of the potassium salts relative to the total molar amount of phosphorus of the potassium salts.

Yet further, the present ~~invention~~ 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.

In another aspect, there is provided the use of at least one potassium salt of a phosphorus oxyacid 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 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, and wherein if two or more potassium salts are employed, the molar ratio of potassium relative to phosphorus is defined by the total molar amount of potassium of the salts relative to the total molar amount of phosphorus of the salts.

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 catalytic system comprising a catalyst comprising a titanium zeolite of structure type MWW comprising zinc and at least one potassium salt of a phosphorus oxyacid, wherein the molar ratio of potassium relative to phosphorus in the at least one potassium salt of ~~the at least one~~a phosphorus oxyacid is in the range of from 0.6 to 1.4, and wherein if two or more potassium salts are employed, the molar ratio of potassium relative to phosphorus is defined by the total molar amount of potassium of the potassium salts relative to the total molar amount of phosphorus of the potassium salts.

2. The catalytic system 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 the range of from 1 to 10, preferably from 1 to 5, more preferably from 1 to 3, and wherein x is in the range of from 0.6 to 1.4, preferably from 0.7 to 1.3, more preferably from 0.8 to 1.2, wherein n is preferably in the range of from 0.95 to 1.05 and wherein x is preferably in the range of from 0.95 to 1.05, and wherein formula (I) defines the sum of all potassium salts dissolved in the liquid feed stream.

3. The catalytic system of claim 1 or 2, wherein the titanium zeolite of structure type MWW comprising zinc which is comprised in the catalyst in (ii) contains titanium, calculated as elemental titanium, in an amount in the range of from 0.1 to 5 weight-%, preferably from 1 to 2 weight-%, based on the total weight of the titanium zeolite of framework structure type MWW comprising zinc, and contains zinc, calculated as elemental zinc, in an amount in the range of from 0.1 to 5 weight-%, preferably from 1 to 2 weight-%, based on the total weight of the titanium zeolite of framework structure type MWW comprising zinc.

~~4. The catalytic system of any of claims 1 to 3 for the epoxidation of propene.~~

~~5. The catalytic system of any of claims 1 to 4, being obtainable or obtained by~~

~~(i') providing a liquid feed stream comprising propene, hydrogen peroxide, acetonitrile, water, optionally propane, and the at least one preferably dissolved potassium salt of a phosphorus oxyacid, wherein the 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 is preferably in the range of from $25x10^{-6}$:1 to $250x10^{-6}$:1, more preferably from $50x10^{-6}$:1 to $200x10^{-6}$:1, more preferably from $100x10^{-6}$:1 to $150x10^{-6}$:1, and wherein~~

~~the weight ratio of water relative to acetonitrile in the liquid feed is preferably at most 1:4, more preferably in the range of from 1:50 to 1:4, more preferably from 1:15 to 1:4.1, more preferably from 1:10 to 1:4.2;~~

~~(ii') passing the liquid feed stream provided in (i') into an epoxidation reactor comprising the catalyst comprising a titanium zeolite of structure type MWW comprising zinc, wherein in (ii'), the liquid feed stream is preferably subjected 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.~~

~~6. The catalytic system of claim 5, having a deactivation rate of at most 0.010 K/d at an operating time of 500 h, preferably of at most 0.007 K/d at an operating time of 1000 h, more preferably of at most 0.005 K/d at an operating time of 2000 h.~~

~~7~~4. Use of at least one potassium salt of a phosphorus oxyacid wherein the molar ratio of potassium relative to phosphorus in the at least one potassium salt of ~~the at least one~~a 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, ~~preferably in acetonitrile as solvent, and preferably with hydrogen peroxide as epoxidation agent~~ and wherein if two or more potassium salts are employed, the molar ratio of potassium relative to phosphorus is defined by the total molar amount of potassium of the salts relative to the total molar amount of phosphorus of the salts.