WO 2012/157473 relates to a method for producing a titanosilicate-containing catalyst and its use in an epoxidation reaction of an olefin with hydrogen peroxide. A buffering agent may be added, wherein the specific examples of preferred buffering agents are ammonium salts, wherein ammonium benzoate, ammonium dihydrogen phosphate and diammonium hydrogen phosphate are preferred.

Xiangqing Fang *et al.*, *Phys. Chem. Chem. Phys.* **2013**, *15*, 4930-4938 relates to a titanosilicate of the MWW type in which fluorine species have been implanted by post-treatment.

US 2010/0234623 relates to a method for producing propylene oxide in the presence of a supported gold cluster catalyst.

Lihao Tang *et al.*, *Macromolecules*, **2008**, *41*, 7306-7315 discloses catalysts for the ring-opening polymerization of ethylene oxide and propylene oxide based on products of alkylammonium compounds with bulky tetraphenol ligands.

It was an object of the present 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 disclosure to provide a catalytic system which exhibits an excellent long-time stability, in particular in terms of propylene oxide selectivity and hydrogen peroxide conversion.

Surprisingly, it was found that these objects can be solved if in the continuous reaction, a 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.

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;

(ii) passing the feed stream provided in (i) into an epoxidation reactor comprising a catalyst comprising a titanium zeolite of structure type MWW, and subjecting the feed

stream to epoxidation reaction conditions in the epoxidation reactor, obtaining a reaction mixture comprising propylene oxide, acetonitrile, water, the at least one potassium salt, 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 potassium salt, optionally propene, and optionally propane.

Further, the present disclosure relates to a catalytic system comprising a catalyst comprising a titanium zeolite of structure type MWW optionally comprising zinc, and at least one potassium salt, wherein the at least one potassium salt is selected from the group consisting of at least one inorganic potassium salt, at least one organic potassium salt, and combinations of at least one inorganic potassium salt and at least one organic potassium salt.

In an aspect, there is provided a catalytic system of a continuous process for the preparation of propylene oxide, comprising: a titanium zeolite of structure type MWW optionally comprising zinc; and a potassium salt dissolved in an aqueous acetonitrile mixture: wherein the potassium salt comprises at least one selected from the group consisting of an inorganic potassium salt, and an organic potassium salt.

In another aspect, there is provided a continuous process for the preparation of propylene oxide, comprising:
acetonitrile as solvent; hydrogen peroxide as epoxidation agent; and the catalytic system as defined above.

Step (i)

Surprisingly, it was found that the presence of at least one dissolved potassium salt in the liquid feed stream provided in (i) allows for an excellent epoxidation performance of the epoxidation catalyst employed in (ii) which comprises the titanium zeolite of framework structure type MWW, in contrast to the prior art which recommends ammonium dihydrogen phosphate as additive. Yet further, it was surprisingly found that while the corresponding potassium salt, potassium dihydrogen phosphate, is by far the better additive, the epoxidation characteristics in terms of hydrogen peroxide conversion and propylene oxide selectivty can still be improved if organic potassium salts are used as additives.

Regarding the chemical nature of the at least one potassium salt is concerned, no specific restrictions exist. Preferably, the at least one potassium salt is selected from the group consisting of at least one inorganic potassium salt, at least one organic potassium salt, and

combinations of at least one inorganic potassium salt and at least one organic potassium salt.

Preferred inorganic potassium salts include, but are not restricted to, potassium halides such as potassium chloride or potassium bromide, potassium nitrate, potassium sulfate, potassium hydrogen sulfate, potassium hydroxide, potassium perchlorate, potassium salts comprising phosphorus such as potassium dihydrogen phosphate or dipotassium hydrogen phosphate or potassium phosphate or potassium pyrophosphates such as monobasic potassium pyrophosphate or dibasic potassium pyrophosphate or tribasic potassium pyrophosphate or tetrabasic potassium pyrophosphate, or potassium etidronates such as monobasic

Claims

1. A catalytic system of a continuous process for the preparation of propylene oxide, comprising: a titanium zeolite of structure type MWW optionally comprising zinc; and a potassium salt dissolved in an aqueous acetonitrile mixture: wherein the potassium salt comprises at least one selected from the group consisting of an inorganic potassium salt, and an organic potassium salt.

2. The catalytic system according to claim 1, wherein the potassium salt comprises an inorganic potassium salt which is selected from the group consisting of potassium hydroxide, potassium chloride and potassium nitrate.

3. The catalytic system of claim 1, wherein a content of titanium, calculated as elemental titanium, is from 0.1 to 5 weight-%,

based on the total weight of the titanium zeolite of framework structure type MWW.

4. A continuous process for the preparation of propylene oxide, comprising: acetonitrile as solvent; hydrogen peroxide as epoxidation agent; and the catalytic system of claim 1.

5. The catalytic system according to claim 1, wherein the potassium salt comprises an organic potassium salt which is selected from the group consisting of potassium formate, potassium acetate, potassium carbonate and potassium hydrogen carbonate.

6. The catalytic system of claim 1, wherein the titanium zeolite of structure type MWW comprises zinc and a content of the zinc, calculated as elemental zinc, is from 0.1 to 5 weight-%, based on the total weight of the titanium zeolite of framework structure type MWW.