SUMMARY

With respect to this prior art, the object of the present disclosure~~invention~~ is to improve a plant of the type mentioned at the outset in such a manner that continuous separation and recirculation of the active catalyst to the reaction space is possible with a long filter service life.

This object is achieved by a plant for carrying out chemical reactions which has at least one reactor, the reaction space of which contains hydrogen peroxide and titanium silicalite,

- wherein the reaction space contains a solid silicon source,
- wherein the plant comprises a water takeoff line which is set up for drawing off water in addition to components which are dissolved and/or dispersed therein from the reaction space,
- wherein the water takeoff line leads to a filter which separates off the components which are dissolved and/or dispersed in the water,
- and wherein the plant has a return line which is set up for recirculating to the reaction space components which are separated off by means of the filter.

In an aspect, there is provided a plant for carrying out chemical reactions, having at least one reactor (1), the reaction space of which contains hydrogen peroxide and titanium silicalite, characterized a) in that the reaction space contains a solid silicon source being precipitated silicic acid, b) in that the plant comprises a water takeoff line (3) which is set up for drawing off water in addition to components which are dissolved and/or dispersed therein from the reaction space, c) in that the water takeoff line (3) leads to a filter (4) which separates off the components which are dissolved and/or dispersed in the water, d) and in that the plant has a return line (5) which is set up for recirculating to the reaction space components which are separated off by means of the filter (4).

In another aspect, there is provided the use of a plant as defined above for carrying out an ammoximation, in particular a two-phase ammoximation.

In yet another aspect, there is provided a process for carrying out an ammoximation reaction carried out in the presence of titanium silicalite, characterized in that water having titanium silicalite dissolved and/or dispersed therein is taken off from the reaction, in that the titanium silicalite which is taken off is separated off from the water via a filter and recirculated to the reaction, and in that a solid silicon source is added to the reaction, wherein said solid silicon source is precipitated silicic acid.

DETAILED DESCRIPTION

The present invention is based on the finding that, using the addition of a solid silicon sacrificial system, it is possible to stop effectively the dissolution process of the catalyst at the level of the nanoscale catalyst particles, to avoid the formation of inert TiO_2, to effectively prevent the formation of irreversible covering layers on filtration membranes and thereby ultimately to increase the filter service life.

Addition of the solid Si sacrificial system enables the reaction to be carried out effectively in the presence of titanium silicalite and hydrogen peroxide on the plant according to the invention in which the catalyst and/or its residues are separated off by means of a filter which is connected to the reaction space by the water takeoff line or by the return line and thus permits recycling of the titanium silicalite which is flushed away with the excess reaction water. The said water is generally not pure H_2O, but an

5. A plant according to claim 4~~6~~, characterized in that the filter (4) is incorporated into the reactor wall.

6. A plant according to claim 4~~6~~, wherein the reactor (1) is provided with an agitator (10), characterized in that the filter (4) is constructed as a filter tube (40) surrounding the agitator (10).

7. A plant according to any one of claims 1 to 6, characterized in that the filter (4) is a membrane filter having a ceramic membrane.

8. A plant according to claim 7, characterized in that the filter (4) is a cross flow filter.

9. Use of a plant according to any one of claims 1 to 8 for carrying out an ammoximation, in particular a two-phase ammoximation.

10. A process for carrying out an ammoximation reaction carried out in the presence of titanium silicalite, characterized in that water having titanium silicalite dissolved and/or dispersed therein is taken off from the reaction, in that the titanium silicalite which is taken off is separated off from the water via a filter and recirculated to the reaction, and in that a solid silicon source is added to the reaction, wherein said solid silicon source is precipitated silicic acid.

11. A process according to claim 10, characterized in that the ratio of the mass of the silicon source to the mass of the titanium silicalite is 1:1 or greater, preferably about 3:1.

12. A process according to any one of claims 10 to 11, characterized in that the water is taken off, and the titanium silicalite separated off is recirculated continuously.