Claims

1. A method of preparing chlorine dioxide (ClO_2) from hydrochloric acid (HCl) and sodium chlorite ($NaClO_2$) in the presence of water (H_2O),
characterized in that

   a) the hydrochloric acid is used in aqueous solution at a concentration of 27 to 33 wt%;

   b) the sodium chlorite is used in aqueous solution at a concentration of 22 to 27 wt%;

   c) and the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.14 and 4.2.

2. A method according to claim 1 conducted in a reactor,
characterized in that
the reactor residence time of reactants is less than 6 seconds, especially 5 seconds.

3. A method according to claim 1 or 2,
characterized in that

   a) the hydrochloric acid is used in aqueous solution at a concentration of 30 wt%;

   and/or

   b) the sodium chlorite is used in aqueous solution at a concentration of 25 wt%.

4. A method according to claim 1, 2 or 3,
characterized in that
the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.19 and 3.6 and especially between 2.4 and 3.4.

5. A method according to claim 4,
characterized in that
the molar ratio of hydrochloric acid used to sodium chlorite used is 2.64.

6. A method according to any preceding claim conducted in a reactor,
characterized in that
the reactor is surrounded by water.

7. A method according to claim 6,
characterized in that
the chlorine dioxide emerging from the reactor in aqueous solution is diluted with water and then mixed with the water surrounding the reactor.

8. A method of treating water (H_2O) with chlorine dioxide (ClO_2) comprising the steps of:

a) providing water to be treated;

b) providing a reactor;

c) immersing the reactor in the water to be treated;

d) providing hydrochloric acid (HCl) in aqueous solution outside the water to be treated;

e) providing sodium chlorite ($NaClO_2$) in aqueous solution outside the water to be treated;

f) conveying the aqueous hydrochloric acid and the aqueous sodium chlorite into the reactor;

g) reacting the aqueous hydrochloric acid and the aqueous sodium chlorite in the reactor to form chlorine dioxide (ClO_2) in aqueous solution;

h) mixing the aqueous chlorine dioxide with the water to be treated;

characterized in that

i) the hydrochloric acid is provided in aqueous solution at a concentration of 27 to 33 wt%;

k) the sodium chlorite is provided in aqueous solution at a concentration of 22 to 27 wt%;

l) and the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.14 and 4.2.

9. A method according to claim 8,
characterized in that
the reactor residence time of reactants is less than 6 seconds, especially 5 seconds.

10. A method according to claim 8 or 9,
characterized in that

a) the hydrochloric acid is used in aqueous solution at a concentration of

30 wt%;

and/or

b) the sodium chlorite is used in aqueous solution at a concentration of 25 wt%.

11. A method according to claim 8, 9 or 10, characterized in that the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.19 and 3.6 and especially between 2.4 and 3.4.

12. A method according to claim 11, characterized in that the molar ratio of hydrochloric acid used to sodium chlorite used is 2.64.

13. Apparatus comprising a sodium chlorite storage tank (1), a hydrochloric acid storage tank (2), two pumps (3, 4) for conveying hydrochloric acid (HCl) in aqueous solution at a first volume flow rate (V_{HCL}) and sodium chlorite ($NaClO_2$) in aqueous solution at a second volume flow rate (V_{NaClO2}) respectively from the respective tanks (2, 3) into a reactor (5), characterized by means whereby the first volume flow rate (V_{HCL}) and the second volume flow rate (V_{NaClO2}) are equalized.

14. Apparatus according to claim 13, characterized in that the two pumps (3, 4) have the same suction volume and are driveable at the same speed by a conjoint drive via a conjoint driveshaft.

15. The use of apparatus according to claim 13 or claim 14 for conducting a method according to any one of claims 1 to 12, especially for conducting a method

according to claim 5 or claim 12.

Claims

1. A method of preparing chlorine dioxide (ClO_2) from hydrochloric acid (HCl) and sodium chlorite ($NaClO_2$) in the presence of water (H_2O),
characterized in that

   a) the hydrochloric acid is used in aqueous solution at a concentration of 27 to 33 wt%;

   b) the sodium chlorite is used in aqueous solution at a concentration of 22 to 27 wt%;

   c) the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.14 and 4.2.

   d) and the reactor residence time of reactants is less than 6 seconds, especially 5 seconds.

2. A method according to claim 1,
characterized in that

   a) the hydrochloric acid is used in aqueous solution at a concentration of 30 wt%;

   and/or

   b) the sodium chlorite is used in aqueous solution at a concentration of 25 wt%.

3. A method according to claim 1 or 2,
characterized in that
the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.19

and 3.6 and especially between 2.4 and 3.4.

4. A method according to claim 3,
characterized in that
the molar ratio of hydrochloric acid used to sodium chlorite used is 2.64.

5. A method according to any preceding claim conducted in a reactor,
characterized in that
the reactor is surrounded by water.

6. A method according to claim 5,
characterized in that
the chlorine dioxide emerging from the reactor in aqueous solution is diluted with water and then mixed with the water surrounding the reactor.

7. A method of treating water (H_2O) with chlorine dioxide (ClO_2) comprising the steps of:

a) providing water to be treated;

b) providing a reactor;

c) immersing the reactor in the water to be treated;

d) providing hydrochloric acid (HCl) in aqueous solution outside the water to be treated;

e) providing sodium chlorite ($NaClO_2$) in aqueous solution outside the water to be treated;

f) conveying the aqueous hydrochloric acid and the aqueous sodium chlorite into the reactor;

g) reacting the aqueous hydrochloric acid and the aqueous sodium chlorite in the reactor to form chlorine dioxide (ClO_2) in aqueous solution;

h) mixing the aqueous chlorine dioxide with the water to be treated;

characterized in that

i) the hydrochloric acid is provided in aqueous solution at a concentration of 27 to 33 wt%;

k) the sodium chlorite is provided in aqueous solution at a concentration of 22 to 27 wt%;

l) the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.14 and 4.2;

m) and the reactor residence time of reactants is less than 6 seconds, especially 5 seconds.

8. A method according to claim 7,
characterized in that

a) the hydrochloric acid is used in aqueous solution at a concentration of 30 wt%;

and/or

b) the sodium chlorite is used in aqueous solution at a concentration of 25 wt%.

9. A method according to claim 8,
characterized in that
the molar ratio of hydrochloric acid used to sodium chlorite used is between 2.19

and 3.6 and especially between 2.4 and 3.4.

10. A method according to claim 9,
characterized in that
the molar ratio of hydrochloric acid used to sodium chlorite used is 2.64.