Claims

1. A process for producing a concentrated nano titania sol comprising:

   (a) contacting an acidic nano titania sol with a dispersant comprising at least one of a water soluble carboxylic acid, a water soluble salt of a carboxylic acid, a water soluble polycarboxylic acid, a phosphate or a silicate, and with an alkalizing agent wherein the pH of the nano titania sol after contacting is in a range of between 4.0 and 10.0; and
   (b) subjecting the pH adjusted nano titania sol to membrane filtration and continuing such membrane filtration until the nano titania sol contains more than 300 g TiO_2 nanoparticles/dm^3.

2. The process according to claim 1, wherein the nano titania sol contains more than 500g TiO_2 nanoparticles/dm^3.

3. The process according to claim 1 or 2, wherein the membrane filtration is crossflow filtration or crossflow filtration with vibration.

4. The process according to claim 1 or 2, or claim 3, wherein:

   (i) the provided acidic nano titania sol is produced from a substantially sulphate-ion-free aqueous suspension of titania hydrate contacted with a strong monoprotic acid; and/or
   (ii) the pH adjusted nano titania sol is contacted with a washing agent during step (b) for a period of time sufficient to reduce the nano titania sol's conductivity to less than 10 mS/cm; and/or
   (iii) the alkalizing agent is a water soluble alkanolamine or choline hydroxide.

5. The process according to claim 1 or 2, or claim 3 or 4, wherein at least one of the following applies:

   (i) the water soluble carboxylic acid is an α-hydroxy carboxylic acid or a β-hydroxy carboxylic acid and the water soluble polycarboxylic acid is a dicarboxylic acid or a tricarboxylic acid; or
   (ii) the water soluble carboxylic acid is citric acid.

6. The process according to claim 1 or 2, or any of claims 3-5, wherein the nano titania sol consists essentially of:

   (i) anatase TiO_2 nanoparticles having a particle size of less than 150 nm; or
   (ii) anatase TiO_2 nanoparticles having a particle size of less than 100 nm.

7. The process according to any one of claims 1-6, wherein the nano titania sol is subjected to a coating treatment either before step (b) or during step (b) after the pH adjusted nano titania sol has been contacted with the washing agent to remove soluble salts from the nano titania sol but prior to concentrating the nano titania sol.

8. The process according to claim 7, wherein the coating treatment comprises contacting the nano titania sol with an alkaline coating agent and a cation exchange resin at a rate such that the pH of the nano titania sol remains in a range between 4.0 and 10.0 during the coating treatment.

9. The process according to claim 7, wherein the coating treatment comprises contacting the nano titania sol with an acidic coating agent and an anion exchange resin at a rate such that the pH of the nano titania sol remains in a range between 4.0 and 10.0 during the coating treatment.

10. The process according to claim 1, wherein the process comprises the step of:

    providing an acidic nano titania sol;
    before then carrying out the steps of

    (a) contacting the acidic nano titania sol with a dispersant comprising at least one of a water soluble carboxylic acid, a water soluble salt of a carboxylic acid, a water soluble polycarboxylic acid, a phosphate or a silicate, and with an alkalizing agent, wherein the pH of the nano titania sol after contacting is in a range of between 4.0 and 10.0; and
    (b) subjecting the pH adjusted nano titania sol to membrane filtration and continuing such membrane filtration until the nano titania sol contains more than 300 g TiO_2 nanoparticles/dm^3.

11. A concentrated aqueous nano titania sol containing more than 300 g TiO_2 nanoparticles/dm^3, the sol being obtainable by being produced according to the process of any one of claims 1-9.

12. A catalytic composition comprising a concentrated aqueous nano titania sol containing more than 300 g TiO_2 nanoparticles/dm^3, the sol being obtainable by being produced according to the process of any one of claims 1-6.

13. A method for protecting a surface of a substrate from UV radiation comprising:

    applying a concentrated aqueous nanotitania sol to the surface of the substrate to form a protective coating on the surface of the substrate, the sol containing more than 300g TiO_2 nanoparticles/dm^3, and the sol being obtainable by being produced according to the process of any one of claims 7-9, optionally in the presence a binder medium.

14. A method for degrading or inactivating contaminants or pollutants that contact a surface comprising:

    applying a catalytic composition to the surface, the composition comprising a concentrated aqueous nanotitania sol containing more than 300 g TiO_2 nanoparticles/dm^3, the sol being obtainable by being produced according to the process of any one of claims 1-6; and
    allowing the surface to be irradiated with UV/visible light while the contaminants or pollutants contact the surface.

15. A coating or article comprising the concentrated aqueous nano titania sol according to claim 11.