a silver ion; an antibacterial, antifungal, and antiviral agent containing the same as the active agent; and an antibacterial, antifungal, and antiviral agent compatible with various vehicles and carriers, sustains its activity for long, and has reduced peroral rout toxicity, skin irritation and mucosa irritation.

EP 2,448,416 A1. (Text from WO/2011/002929A1) Preservative antimicrobial compositions comprising low concentrations of botanical extracts, in synergistic combinations with alkanediols in a solvent system, optionally with fruit acids. Furthermore, the present invention relates to a preservative or antimicrobial compositions which comprise a silver compound, an essential oil or individual constituent, one or more zinc salts, and one or more alkanediol. The compositions of the invention may be used in personal care products including wound care products or in veterinary use. Preferably, the compositions of the invention have little or no human-detectable fragrance.

SUMMARY

The main object of the present disclosure is the use of nanotechnology for the development of a titanium dioxide nanomaterial with herbal or fruit extracts adsorbed on the surface thereof for use in inactivating any type of

virus, and killing of bacteria, fungi, mycoplasma, mycobacteria, protozoa and spores.

In one aspect of the present disclosure, there is provided a composite nanomaterial for the preparation of disinfectant, antiseptic, healing or cleaning composition, said composite nanomaterial comprising:

a nanoparticulate titanium dioxide (TiO_2) support having a surface and pores, a mean diameter particle size between 1 and 100 nm and a surface area of at least 50 m^2/g, the nanoparticulate titanium dioxide being in a crystalline structure;

functional groups chemically adsorbed on the surface of the nanoparticulate titanium dioxide support, the functional groups comprising an hydroxyl as organic functional groups and inorganic radicals; and

herbal and fruit extracts physically adsorbed on the surface and pores of the titanium dioxide (TiO_2) support, the herbal and fruit extracts comprising particles of size between 0.3 to 10 nm,

wherein the fruit and herbal extracts comprise a mixture of at least three fruit and/or herbal extracts and the mixture comprises citric extracts.

In another aspect of the present disclosure, there is provided a method for preparing a composite nanomaterial for the preparation of disinfectants or

antiseptics as defined herein, the method comprising:

a) preparing herbal and fruit extracts;

b) providing a support comprising nanoparticulate titanium dioxide (TiO_2), comprising a surface and pores, a mean particle diameter between 1 and 100 nm and a surface area of at least 50 m^2/g, the nanoparticulate titanium dioxide being in crystalline structure;

c) providing precursor solutions which provide organic functional groups and inorganic radicals as functional groups;

d) performing a chemical modification of the nanoparticulate titanium dioxide by adsorption of the functional groups by the addition of the precursor solutions to the nanoparticulate titanium dioxide, by agitation at a constant temperature;

e) providing herbal and fruit ethanolic extracts, comprising particles size between 0.3 to 10 nm;

f) performing physical modification of the nanoparticulate titanium dioxide by adsorption of fruit and herbal ethanolic extracts by adding a mixture of at least three herbal and fruit ethanolic extracts that comprises citric extracts to the nanoparticulate titanium dioxide, after the adsorption of the functional groups, by agitation at constant temperature to the nanoparticulate.

In yet another aspect of the present disclosure, there is provided a disinfectant, antiseptic, healing or cleaning composition comprising:

up to 40% of the nanomaterial as defined herein; and various proportions of selected raw materials.

The optimization of said nanomaterial allowing for the control of the following parameters: support acidity, BET area, pore size distribution, particle size, functionalization extent, dispersion of adsorbed extracts onto the support is significant in order to gain a high activity to break CC and CN bonds of protein, RNA and DNA in pathogenic microorganisms. It is of significance that said matrix-supported extracts be fully dispersed all over the support so as to obtain a high cracking efficiency on protein and nucleotide CC and CN bonds.

The nanomaterial support is a nanoparticulate inorganic metal oxide functionalized through an impregnation process. Said material have been functionalized and evenly dispersed with extracts having a small particle size (0.3-10 nm).

The present disclosure addresses current issues of disinfectants, most of which are pollutants, irritants, toxic, non-biodegradable or even carcinogenic. Besides being selective, no harm is caused to

human beings, which is a further advantage versus non-toxic disinfectants.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1. Extraction system of herbal and fruit

CLAIMS:

1. A composite nanomaterial for the preparation of disinfectant, antiseptic, healing or cleaning composition, said composite nanomaterial comprising:

a nanoparticulate titanium dioxide (TiO_2) support having a surface and pores, a mean diameter particle size between 1 and 100 nm and a surface area of at least 50 m^2/g, the nanoparticulate titanium dioxide being in a crystalline structure;

functional groups chemically adsorbed on the surface of the nanoparticulate titanium dioxide support, the functional groups comprising an hydroxyl as organic functional groups and inorganic radicals; and

herbal and fruit extracts physically adsorbed on the surface and pores of the titanium dioxide (TiO_2) support, the herbal and fruit extracts comprising particles of size between 0.3 to 10 nm,

wherein the fruit and herbal extracts comprise a mixture of at least three fruit and/or herbal extracts and the mixture comprises citric extracts.

2. The nanomaterial of claim 1, wherein the organic functional groups and inorganic radicals are selected from an hydroxyl, a phosphate, a sulfate, a chloride, an amino, a methyl and a folate.

3. The nanomaterial of claim 1, wherein the fruit extracts are selected from extracts of different parts of citrus plants or fruits, grape, tangerine, orange, grapefruit, lemon, guava or pomegranate.

4. The nanomaterial of claim 1, wherein the herbal extracts are selected from extracts of oregano, cinnamon or pepper.

5. A method for preparing a composite nanomaterial for the preparation of disinfectants or antiseptics according to any one of claims 1 to 4, the method comprising:

a) preparing herbal and fruit extracts;

b) providing a support comprising nanoparticulate titanium dioxide (TiO_2), comprising a surface and pores, a mean particle diameter between 1 and 100 nm and a surface area of at least 50 m^2/g, the nanoparticulate titanium dioxide being in crystalline structure;

c) providing precursor solutions which provide organic functional groups and inorganic radicals as functional groups;

d) performing a chemical modification of the nanoparticulate titanium dioxide by adsorption of the functional groups by the addition of the precursor solutions to the nanoparticulate titanium dioxide, by agitation at a constant temperature;

e) providing herbal and fruit ethanolic extracts, comprising particles size between 0.3 to 10 nm;

f)performing physical modification of the nanoparticulate titanium dioxide by adsorption of fruit and herbal ethanolic extracts by adding a mixture of at least three herbal and fruit ethanolic extracts that comprises citric extracts to the nanoparticulate titanium dioxide, after the adsorption of the functional groups, by agitation at constant temperature to the nanoparticulate.

6. The method according to claim 5, wherein the organic functional groups and inorganic radicals in the precursor solutions are selected from an hydroxyl, a phosphate, a sulfate, a chloride, an amino, a methyl and a folate.

7. The method of claim 5, wherein the chemical modification of the nanoparticulate titanium dioxide is performed under a constant agitation at an average speed in the range of 100 to 400 RPM.

8. The method of claim 5, wherein the chemical modification of the nanoparticulate titanium dioxide is made at constant temperature which is in the range of 30 to 100 °C.

9. The method of claim 5, wherein physical modification of the nanoparticulate titanium dioxide is made at constant temperature which is in the range of 30 to 50 °C.

10. The method of claim 5, wherein the precursor solutions are added dropwise one by one leaving a waiting time between the addition of each organic functional group or inorganic radical precursor solution.

11. The method according to claim 10, wherein said waiting time after addition of each precursor solution is from 5 to 30 minutes.

12. The method of claim 11, wherein said modification of the nanoparticulate titanium dioxide further comprises drying the nanoparticulate titanium dioxide obtained at a temperature from 30 to 100 °C before adding the fruit and herbal extracts.

13. The method of claim 12, wherein the step of performing the physical modification of the nanoparticulate titanium dioxide comprises performing physical adsorption of the herbal and fruit extracts in an aqueous extracts mixture solution at 70 %.

14. The method of claim 13, wherein the step of performing the physical modification of the nanoparticulate titanium dioxide for the adsorption of the herbal and fruit extracts requires an agitation period of 24 hours.

15. The method according to claim 14, wherein the fruit extracts are selected from different parts of citrus plants or fruits, grape, tangerine, orange, grapefruit, lemon, guava or pomegranate extracts.

16. The method according to claim 14, wherein the herbal extracts are selected from oregano, cinnamon or pepper extracts.

17. A disinfectant, antiseptic, healing or cleaning composition comprising:

up to 40% of the nanomaterial of any one of claims 1 to 4; and

various proportions of selected raw materials.