CLAIMS

We claim:

1. A collection of nanoparticles suitable for use in hyperthermia treatment by light irradiation at a wavelength in the transparency window of biological tissue, wherein each nanoparticle comprises:

a crystalline host structure, and

at least one species of rare-earth dopant ion.

2. A collection of nanoparticles in accordance with claim 1, wherein the concentration of the at least one species of dopant is in the range 30 to 100 molecular %.

3. A collection of nanoparticles in accordance with claim 1, wherein the concentration of the at least one species of dopant is in the range 80 to 100 molecular %.

4. A collection of nanoparticles in accordance with claim 1, wherein the concentration of the at least one species of dopant is in the range 90 to 100 molecular %.

5. A collection of nanoparticles in accordance with claim 1, wherein the concentration of the at least one species of dopant is in the range 95.0 to 100.0 molecular %.

6. A collection of nanoparticles in accordance with claim 1, wherein the at least one species of rare-earth dopant ion is selected from the list of Dy^{3+}, Pr^{3+}, Nd^{3+}, Sm^{3+}, Eu^{3+}, Tb^{3+}, Ho^{3+}, Er^{3+}, and Tm^{3+} ions.

7. A collection of nanoparticles in accordance with claim 1, wherein the crystalline host structure is a dielectric material.

8. A collection of nanoparticles in accordance with claim 7, wherein the dielectric is a phosphate, a vanadate, a molibdate, a tungstate, an oxide or a fluoride.

9. A collection of nanoparticles in accordance with claim 1, wherein the crystalline host structure is a semiconductor material.

10. A collection of nanoparticles in accordance with claim 1, wherein the average diameter of the nanoparticles is in the range 5 to 500 nm

11. A collection of nanoparticles in accordance with claim 1, wherein the average diameter of the nanoparticles is in the range 20 to 60 nm.

12. A collection of nanoparticles in accordance with claim 1, wherein the crystalline host structure may be double or triple doped by any combinations of Dy^{3+}, Pr^{3+}, Nd^{3+}, Sm^{3+}, Eu^{3+}, Tb^{3+}, Ho^{3+}, Er^{3+}, Tm^{3+}, and Yb^{3+} ions.

13. A collection of nanoparticles in accordance with claim 1, wherein the nanoparticles have a core of a first host material doped with one or more types of rare earth dopant ions and a shell of a second host material doped with one or more types of rare earth dopant ions.

14. A collection of nanoparticles in accordance with claim 13, wherein the concentration of the dopant ions in the core is less than 1 mol% and the concentration of the dopant ions in the shell is in the range 30-100 mol%.

15. A collection of nanoparticles in accordance with claim 1, wherein the nanoparticles are conjugated with molecules that specifically bind to a target cell.

16. A collection of nanoparticles in accordance with claim 15, wherein the conjugated molecules are antibodies suitable for the formation of an antigen/ antibody complex with the target cell.

17. A collection of nanoparticles in accordance with claim 15, wherein the conjugated molecules are liposomes having targeting ligands suitable for the formation of a ligand/ receptor complex with the target cell.

18. A collection of nanoparticles in accordance with claim 1 for use in the hyperthermia treatment of over-proliferating cells.

19. A collection of nanoparticles in accordance with claim 1 for use in the hyperthermia treatment of over-proliferating cells, wherein the over-proliferating cells are malignant.

20. A pharmaceutical composition containing the collection of nanoparticles of claim 1.

21. A method of inducing localised hyperthermia in target cells comprising the steps of delivering nanoparticles of the type claimed in claim 1 to cells and exposing the nanoparticles to electromagnetic radiation.

22. A method of inducing localised hyperthermia and imaging target cells, comprising the steps of delivering nanoparticles of the type claimed in claim 1 to cells and

exposing the nanoparticles to electromagnetic radiation and detecting the absorption, fluorescence or scattering of the radiation to simultaneously heat and view the target cells.

23. A method of inducing localised hyperthermia in target cells in accordance with claim 21, wherein the electromagnetic radiation has a wavelength in a biological transparency window of 800-900nm.

24. A method of inducing localised hyperthermia in target cells in accordance with claim 21, wherein the method is applied to cells in vitro.

25. A method of inducing localised hyperthermia in target cells in accordance with claim 21, wherein the conjugated molecules are antibodies suitable for the formation of an antigen/ antibody complex with the target cell.