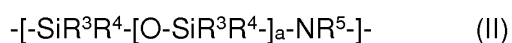
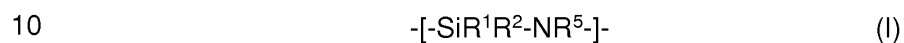


Claims

1. Formulation comprising:
a polymer comprising a first repeating unit M¹ and a second
5 repeating unit M²; and
surface-modified zirconium dioxide nanocrystals;
wherein the first repeating unit M¹ is represented by formula (I) and
the second repeating unit M² is represented by formula (II):



- wherein R¹, R², R³, R⁴ and R⁵ are at each occurrence
15 independently from each other selected from the group consisting of
hydrogen, organyl and organoheteryl; and
a is an integer from 1 to 60.

2. Formulation according to claim 1,
20 wherein the polymer comprises at least one further repeating unit
M¹ which is represented by formula (I), wherein the at least one further
repeating unit M¹ is different from the first repeating unit M¹.
3. Formulation according to claim 1 or 2,
25 wherein R¹ and R² are at each occurrence independently from each
other hydrogen or alkyl having 1 to 20 carbon atoms or phenyl.
4. Formulation according to one or more of claims 1 to 3,
wherein R³ and R⁴ are independently from each other hydrogen or
30 alkyl having 1 to 40 carbon atoms or phenyl.
5. Formulation according to one or more of claims 1 to 4,

wherein R⁵ is at each occurrence independently hydrogen or alkyl having 1 to 20 carbon atoms or phenyl.

- 5 6. Formulation according to one or more of claims 1 to 5,
wherein the surface-modified zirconium dioxide nanocrystals are at least partially capped with a silicone capping agent and optionally a second capping agent selected from the list consisting of vinyltrimethoxysilane, allyltrimethoxysilane, 1-hexenyltrimethoxysilane, 1-octenyltrimethoxysilane, methyltrimethoxysilane,
10 ethyltrimethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, n-octyltrimethoxysilane, n-octyltriethoxysilane, n-dodecyltrimethoxysilane, n-dodecyltriethoxysilane, n-hexadecyltrimethoxysilane, and/or octadecyltrimethoxysilane.
- 15 7. Formulation according to claim 6,
wherein the silicone capping agent comprises a head group covalently linked to said zirconium dioxide nanocrystals and a tail group, wherein said tail group comprises at least a silicone chain.
- 20 8. Formulation according to one or more of claims 1 to 7,
wherein said formulation comprises a solvent system with two groups of solvents A) and B), wherein group A) is one solvent or a mixture of two or more solvents having a boiling point of < 90°C and group B) is one solvent or a mixture of two or more solvents having a
25 boiling point of > 90°C.
9. Formulation according to claim 8,
wherein group A) is selected from the list consisting of esters, ethers and ketones and group B) is selected from the list consisting of
30 esters, ethers, alkanes and aromatic solvents.

10. Method for preparing a formulation according to one or more of claims 1 to 9,
wherein a polymer containing a first repeating unit M^1 and a second repeating unit M^2 is mixed with a dispersion of surface-modified zirconium dioxide nanocrystals.
11. Encapsulation material for an LED, obtainable by
- (a) providing a formulation according to one or more of claims 1 to 9;
and
(b) curing said formulation at a temperature of 70 to 300°C for a period of 1 to 24 h.
12. LED comprising the encapsulation material according to claim 11.
13. LED according to claim 12,
wherein the encapsulation material is comprised in a converter layer which preferably comprises one or more converters selected from phosphors and/or quantum materials.
14. Method for producing an LED comprising the steps of
- (a) applying a formulation according to one or more of claims 1 to 9 to an LED precursor; and
(b) curing the formulation at a temperature of 70 to 300°C for a period of 1 to 24 h.
15. Method for producing an LED according to claim 14,
wherein the formulation which is applied in step (a) to an LED precursor forms part of a converter layer which preferably comprises one or more converters selected from phosphors and/or quantum materials.

16. Method for producing an LED according to claim 14 or 15,
wherein the formulation is applied in step (a) by spray coating.
- 5 17. Method for producing an LED according to claim 16,
wherein the formulation comprises a solvent system with two
groups of solvents A) and B), wherein group A) is one solvent or a
mixture of two or more solvents having a boiling point of < 90°C and
group B) is one solvent or a mixture of two or more solvents having a
10 boiling point of > 90°C.
18. Method for producing an LED according to claim 17,
wherein group A) is selected from the list consisting of esters,
ethers and ketones and group B) is selected from the list consisting of
15 esters, ethers, alkanes and aromatic solvents.

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