A general and versatile procedure for coating of hydrophobic nanocrystals with a thin silica layer enabling facile biofunctionalization and dye incorporation.

Autorzy

Jakub Cichos

Mirosław Karbowiak

Rok wydania

2014

Czasopismo

Journal of Materials Chemistry B

Numer woluminu

2

Strony

556-568

DOI

10.1039/c3tb21442g

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Here we report a method for coating of hydrophobic nanocrystals (NCs) with a thin silica layer. By using this approach 11 nm NaGdF4 NCs were coated with a mesoporous silica shell thinner than 20 nm resulting in highly monodisperse core–shell nanocomposite particles smaller than 50 nm. The synthetic protocol used here is based on the two-phase system that ensures high repeatability of the nanoparticle morphology and can be conveniently adapted for large-scale production. The use of an organic solvent as a diluent for tetraethoxysilane allows us to control not only the thickness, but also the porosity of the uniform silica shell. This procedure can be applied for coating NCs of various sizes and can be generalized to encapsulate other nanocrystals, e.g. semi-conductor quantum dots, into silica spheres. Furthermore, it allows facile surface modification with –NH2 groups that can be then used to conjugate biomolecules to the nanoparticle surface, as well as straightforward incorporation of various organic molecules (e.g. dyes or drugs) into the silica shell during its growth. To demonstrate potential applications up-converting NaGd0.80Yb0.18Er0.02F4 NCs were used as cores and zinc phthalocyanine was incorporated into the silica shell as a photosensitizer. Under irradiation with a 980 nm laser diode efficient generation of singlet oxygen was observed indicating that such nanocomposite particles have the capability to be used for photodynamic therapy.

Adres publiczny

http://dx.doi.org/10.1039/c3tb21442g

Strona internetowa wydawcy

https://www.rsc.org/