Water dispersible silica nanoparticles for biomedical applications

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Abstract

Mesoporous silica nanoparticles are potential agents for biomedical applications. Spherical nanoparticles are synthesized by Stöber method with a core shell structure achieving monodisperse distribution around 50 nm (Figure 1). This work is focused on bioimaging and photodynamic therapy (PDT) applications; for that fluorescent dyes are embedded in the core (bioimaging) and photosensitizers (PS) are grafted on the shell (PDT) functionalized by amine groups (Figure 2).

However, those systems have low stability in water necessary for biomedical applications. In this sense, polyethylene glycol (PEG) is the most used macromolecule to coat the nanoparticles since it is non-toxic, biocompatible, it prolongs the nanoparticles life-time in blood, and is approved by the Food And Drug Administration (FDA) for clinical use.² PEG of different chain lengths are covalently anchored to external groups (-NH₂ or -OH) of mesoporous silica nanoparticles. A result, silica nanoparticles with dual functionality (imaging and treatment) and well-dispersed in water are achieved. “In vitro” experiments will be carried out to probe their therapy activity in cells.

References


Figures

Figure 1: TEM image of mesoporous silica nanoparticles with around 50 nm size (left) and TEM image of the Core-Shell structure of silica nanoparticles (right).

Figure 2: Image of powder synthesized for Rose Bengal grafted onto hydroxyl groups (left) and onto amine groups (right).