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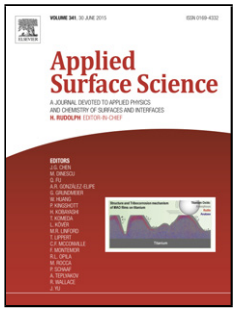

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Hydrophilic quantum dots stability against an external low-strength electric field

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ABSTRACT

Since the stability of nanobiolabels plays a key role in their application, we thoroughly investigated how an external, low-strength electric field impacts on the fluorescent properties of hydrophilic quantum dots (QDs). Two fundamentally different approaches were applied to make the QDs water-soluble, i.e. ligand exchange (namely silica covering) and encapsulation with an amphiphilic polymer. It is shown that, even under a low-strength electric field, the polymer-coated QDs could lose 90% of their brightness because of the weak interaction between the QD's surface and the polymeric molecule. Silica-covered QDs, on the contrary, stay bright and stable owing to the covalently attached dense silica shell. These findings, which are clearly explained and illustrated in the present paper, are of critical importance in the context of hydrophilic QDs' bioapplication.

Highlights

- **Silica-coated and polymer-covered hydrophilic quantum dots are synthesized and characterized**
- **Impact of low-strength electric field is compared for both hydrophilic shells**
- **Silica shell protects the quantum dots fluorescent core when being subjected to a low-strength electric field**

Keywords: nanocrystals, silica, PEG, amphiphilic polymer, electric field, quantum dots

1. Introduction