

Materials Chemistry and Physics 2012 vol.132 N2-3, pages 488-493

Interfacial adsorption and stripping of ions as a reason of stimuli responsive luminescence of Tb-doped silica nanoparticles

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Abstract

Herein we introduce the "on-off-on" switching of Tb-centered luminescence as a result of reversible adsorption of Fe III ions at the silica/water interface of Tb-doped silica nanoparticles and the stripping effect of anions. The interfacial adsorption of Fe III ions results in the charge neutralization and aggregation of Tb-doped silica nanoparticles, accompanied by significant quenching of Tb-centered luminescence. The analysis of the steady state and time resolved quenching measurements reveals both static and dynamic quenching mechanisms. The addition of EDTA and some phosphates, including ATP results in the deaggregation of nanoparticles due to the complex formation with Fe III ions and following stripping of FeIII ions from the silica surface. The "off-on" switching of Tb-centered luminescence resulted from the stripping effect of biorelevant phosphates is a good basis for further bioanalytical application. © 2011 Elsevier B.V. All rights reserved.

<http://dx.doi.org/10.1016/j.matchemphys.2011.11.058>

Keywords

ATP, Luminescence, Quenching, Silica nanoparticles