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Interfacial interactions of hard polyelectrolyte-stabilized luminescent colloids with substrates

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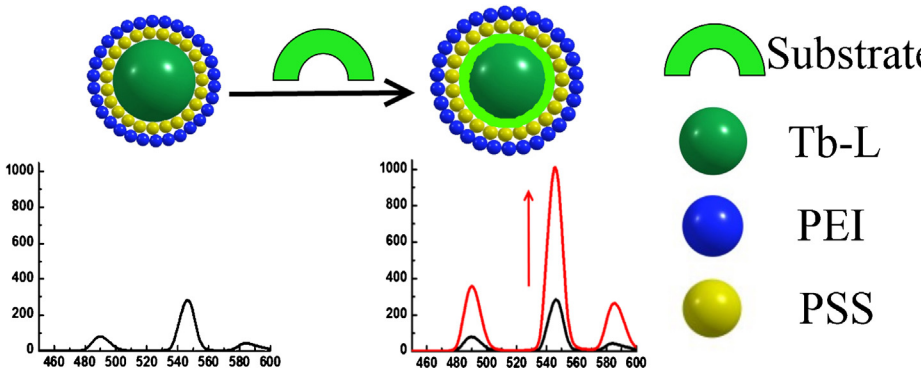
HIGHLIGHTS

- Tb(III) complexes at molecular and colloidal organization levels are compared.
- Interfacial complex formation with substrates differs from that in solution.
- Precipitated Tb(III) complexes form hard templates of polyelectrolyte-coated colloids.
- The colloids exhibit high stability of luminescence at pH 3–9.
- Luminescent response of Tb(III) colloids on substrates results from interfacial complex formation.

GRAPHICAL ABSTRACT



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ABSTRACT

The present work introduces an origin of sensing function of polyelectrolyte-coated colloids based Tb(III) complexes with calix[4]resorcinarene cavitand bearing four *1,3*-diketone groups at the up rim. The Tb(III)-centered luminescence of the colloids remains unchanged at pH 3–9, although Tb(III) complexes are highly pH-dependent in DMF solutions. Both colloidal and luminescent prop ties of the colloids are stable within one month at least, which reveals stability of complex-based h nanotemplates and soft polyelectrolyte deposition. The chelating substrates (catechol, tetracycline a fluoroquinolone derivatives) induce quick and reproducible luminescent response of the complex-bas colloids without any detectable changes of their colloidal properties. The ternary complex formation the interface of the colloids is the reason for their luminescent response on the substrates in aque solutions. Both the insolubility of the Tb(III)-containing cores and the shielding and/or buffer effect of polyelectrolyte coating affect the interfacial complex formation, which results in more selective lu nescent response of the colloids on the tetracycline and fluoroquinolone antibiotics in comparison w the complexes in solutions.

Abbreviations: TEA, triethylamine; PSS, poly(sodium 4-styrenesulfonate); PEI, polyethyleneimine; Tiron, H_2T_2-, 4,5-dihydroxy-1,3-benzenedisulfonic acid disodium monohydrate; DF, difloxacin hydrochloride; MF, moxifloxacin hydrochloride; H2TC, tetracycline hydrochloride; H2CTC, chlortetracycline hydrochloride; H2MC, minocycl hydrochloride; L, 7,11,15,28-tetrakis[(acetylaceton-3-yl)methyl] calix[4]resorcinarene; H2B, 1,2-dihydroxybenzene.

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