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High performance magneto-fluorescent nanoparticles assembled from terbium and gadolinium 1,3-diketones

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Abstract

 Polyelectrolyte-coated nanoparticles consisting of terbium and gadolinium complexes with calix[4]arene tetra-diketone ligand were first synthesized. The antenna effect of the ligand on Tb(III) green luminescence and the presence of water molecules in the coordination sphere of Gd(III) bring strong luminescent and magnetic performance to the core-shell nanoparticles. The size and the core-shell morphology of the colloids were studied using transmission electron microscopy and dynamic light scattering. The correlation between photophysical and magnetic properties of the nanoparticles and their core composition was highlighted. The core composition was optimized for the longitudinal relaxivity to be greater than that of the commercial magnetic resonance imaging (MRI) contrast agents together with high level of Tb(III)-centered luminescence. The tuning of both magnetic and luminescent output of nanoparticles is obtained via the simple variation of lanthanide chelates concentrations in the initial synthetic solution. The exposure of the pheochromocytoma 12 (PC 12) tumor cells and periphery human blood lymphocytes to nanoparticles results in negligible effect on cell viability, decreased platelet aggregation and bright coloring, indicating the nanoparticles as promising candidates for dual magneto-fluorescent bioimaging.

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