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Abstract

Bimodal Nanoprobes Containing Hydrophilic Quantum Dots and Paramagnetic Chelates †

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Abstract: Currently, there is a growing interest in the development of bimodal systems that have a signal for more than one diagnostic imaging technique, such as magnetic resonance imaging (MRI). MRI is able to distinguish pathological from healthy tissues; however, in some cases, a high local concentration of contrast agents (CAs) is necessary to improve the contrast in images. Nanoparticulate CAs are able to concentrate several CA molecules into one nanoparticle, increasing the local concentrations of paramagnetic ions. In this work, we intend to associate $AgInSe_2$ quantum dots (QDs) with gadolinium complexes (DOTA-Gd) to develop bimodal systems. The QDs were prepared in water and the synthesis parameters were optimized. The ligand DOTA was conjugated with cysteamine and complexed with Gd^{3+}. The complex was then conjugated to QDs through the metal–thiol bond, obtaining the bimodal systems. Optical characterization indicated that the QDs remained stable and fluorescent, and an increase in emission intensity after conjugation was observed. The systems were characterized by relaxometry at 20 MHz (0.47 T) and 37 °C, obtaining longitudinal relaxivities by Gd^{3+} higher than the CAs used clinically. Thus, the prepared nanoprobes showed promising properties for MRI and optical imaging.

Keywords: bimodal systems; magnetic resonance imaging; nanoparticulate CAs; $AgInSe_2$ QDs; DOTA-Gd

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