Dual dopants In₂S₃/ZnS quantum dots for targeted fluorescence and magnetic resonance imaging

Jia-Yaw Chang, Pei-Yu Lai

Department of Chemical Engineering, National Taiwan University of Science and Technology, Taiwan

In this work, we describe a rapid microwave-assisted synthesis of Ag⁺ and Mn²⁺ dual-dopants In₂S₃/ZnS quantum dots (Qdots), which integrate functions of optical fluorescence and magnetic resonance imaging. Ag⁺ dopants were used to alter the optical properties of the In₂S₃ host, whereas Mn²⁺ co-dopants with their unpaired electrons provided paramagnetic properties. The emission wavelength of the core/shell Qdots could be tuned from 550 to 743 nm with a quantum yield of 45%. In vitro targeted cell luminescence and magnetic resonance imaging showed that Qdots conjugated to hyaluronic acid was selectively and efficiently internalized in CD44-expressing tumor cells, confirming that the resultant Qdots could function as dual-modal imaging probes for accurate diagnosis. Additionally, the obtained Qdots exhibited negligible cytotoxicity in vitro or in vivo, which rendered them promising diagnostic probes for dual-modal imaging in clinical applications.