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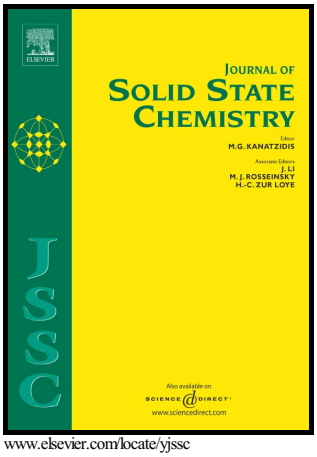

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Multifunctional core-shell silica microspheres and their performance in self-carrier decomposition, sustained drug release and fluorescent bioimaging

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ABSTRACT

An ideal nanocarrier system for drug delivery is that one made from biocompatible and biodegradable materials for safe excretion from the biological system, and often with additional imaging abilities. In the present work, new core-shell silica microspheres have been prepared, with carrier decomposition after drug release. Paclitaxel, which is one of the most efficient drugs against a wide range of malignancies was integrated into the silica core. The carrier decomposition resulted from the escape of drug molecules with loading capacity about 16.95%. To achieve the fluorescents properties of the synthesized material a biocompatible photoluminescent prepared carbon dots were inserted in a silica shell around the Ptx-SiO_2 core. The resultant silica core-shell (Ptx-SiO_2@CDs-SiO_2) NPs with average particle size around ~100 nm showed high fluorescent properties from the confocal laser scanning microscope observation. Further observation under UV-light at 365 nm also confirmed the photoluminescence. The Ptx-SiO_2@CDs-SiO_2 NPs were highly water soluble, and provide a sustained drug release as well as pH sensitivity. The incubation of A549 cells line with Ptx-SiO_2@CDs-SiO_2 NPs exhibits high cellular uptake as shown by CDs imaging. These properties in addition to the biocompatibility of Ptx-SiO_2@CDs-SiO_2 NPs and biodegradability of the silica core contributed simultaneously with the drug release process for easy body excretion after its functionality via renal system.

Graphical abstract