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Magnetofluorescent Fe₃O₄/Carbon Quantum Dots Coated Single-Walled Carbon Nanotubes as Dual-modal Targeted Imaging and Chemo/Photodynamic/Photothermal Triple-modal Therapeutic Agents

Ming Zhang^{a,c}, Wentao Wang^b, Yingjun Cui^c, Xiaohong Chu^a, Baohong Sun^a, Ninglin Zhou^{a,d*}, Jian Shen^{a*}

^a Jiangsu Collaborative Innovation Center of Biomedical Functional Materials, Jiangsu Key Laboratory of Bio-functional Materials, School of Chemistry and Materials Science, Nanjing Normal University, Nanjing 210023, China

^b Jiangsu Key Laboratory for Molecular and Medical Biotechnology, College of Life Sciences, Nanjing Normal University, Nanjing 210023, China

^c Department of Biological Sciences, Florida International University, Miami, Florida 33199, United states

^d Nanjing Zhou Ninglin Advanced Materials Technology Company Limited, Nanjing 211505, China

ABSTRACT

In this work, PEG 2000N modified Fe₃O₄@carbon quantum dots (CQDs) coated single-walled carbon nanotubes (SWNTs) are fabricated and utilized as a multifunctional platform for imaging-guided collaborative treatment of cancer when the obtained agents act as dual photodynamic and photothermal effect under 808 nm laser irradiation. A model chemotherapy drug, doxorubicin (DOX), could be loaded into the pore structure of the obtained SWCNTs-PEG-Fe₃O₄@CQDs nano-carriers with high efficiency. These magnetofluorescent SWCNTs-PEG-Fe₃O₄@CQDs were conjugated with a sgc8c aptamer, denoted as SWCNTs-PEG-Fe₃O₄@CQDs-DOX-Apt, for targeting dual modal fluorescence/magnetic resonance (MR) imaging. Multifunctional SWCNTs-PEG-Fe₃O₄@CQDs-DOX-Apt had a strong effect on the targeted lung cancer cells, in the manner of inducing photodynamic and photothermal ablation, and was found to release DOX rapid following irradiation with pH/NIR laser. The current research demonstrates that SWCNTs-PEG-Fe₃O₄@CQDs-DOX-Apt nanocomposites can be used as an efficient nanoplatform for combining cancer photothermal therapy (PTT), photodynamic therapy (PDT) and chemotherapy (CT).

Keywords: carbon nanotubes, photodynamic, photothermal, sgc8c aptamer, chemotherapy

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