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Functionalized carbon nanotubes for monitoring dual-drug release in tumor cells using SERS and fluorescence techniques

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Currently, stimuli-responsive nanocarrier for dual-drug delivery is considered as a promising approach for highly effective therapy in cancer treatment. However, intracellular monitoring of the dual-drug release is still challenging. Here, we fabricate a pH and thermo dual-stimuli-responsive dual-drug nanocarrier based on gold-silver core-shell nanoparticles (Au@AgNPs) functionalized carbon nanotubes (CNTs). By using label-free surface enhanced Raman scattering (SERS) and fluorescence techniques, we can monitor the dynamic process of drug release. In this nanocarrier a model drug indole is loaded inside the hollow tunnel of CNTs and released into cells by near-infrared (NIR) irradiation. Doxorubicin (DOX) is loaded on the surface of CNTs via π - π stacking and released by changing pH values. In the experiment, to investigate the intracellular traceable delivery performance of this nanocarrier, the dual-drug loaded nanocarrier was incubated with living HeLa cells. Experimental results indicated that the release of indole and DOX can be triggered by the photo-thermal effect and the acidic pH of lysosomes, respectively. Moreover, the combination of released indole and DOX exhibited significant cell-killing effects. The proposed functional CNTs act as an excellent near-infrared and pH-sensitive controllable delivery system for killing cells in application of cancer therapy.

Biography

Peng Chen is a PhD candidate in Advanced Photonic Center of Southeast University. He is now working on SERS and Fluorescence based Optical Biosensor.

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