

Multi walled carbon nanotube/Fe-polymer-organic dye nanohybrids as magnetic-fluorescent contrast agent for cellular imaging

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In recent years, multi walled carbon nanotubes (MWCNT) have received a great deal of attention due to their unique physicochemical properties. It is a promising material for various biosensors. Chemically modification and further functionalized MWCNTs are suitable to prepare an all-in-one diagnostic tool for visualization and detection of several diseases at the cellular level.

In this contribution, we present the preparation way of MWCNT/Fe-based magnetic-fluorescent nanohybrid and their application as a multifunctional cellular imaging agent for magnetic resonance imaging (MRI) and confocal fluorescence microscopy. The MWCNTs were synthesized by Chemical Vapor Deposition (CVD) method using ferrocene as the catalyst [1]. Magnetic properties of iron particles embedded in MWCNT were verified as T₂-weighted contrast agents for MRI. Moreover, the outermost wall of MWCNT/Fe system was chemically oxidized [2] and covalently functionalized with polyethylene glycol (PEG) [3] to improve its solubility and biocompatibility. The MWCNT-PEG complex was characterized by means of Transmission Electron Microscopy (TEM) and Scanning Electron Microscopy (SEM), Raman spectroscopy and Fourier Transform Infrared Spectroscopy (FTIR). The PEGylated nanostructures were also labeled with organic dyes (DAPI, MDC) for further fluorescent imaging. The MWCNT/Fe-PEG-organic dye hybrids were internalized inside HeLa cells for cellular imaging. Additionally, the minimal cytotoxicity effect of PEGylated complexes compare to non-PEGylated samples were revealed (In Cell Analyzer, confocal microscopy).

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References

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