

Application of quantum dots conjugated carbon nanotubes for medical diagnosis and treatment

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Introduction

Fluorescent nanoparticles known as quantum dots (QDs) can be used for localisation of cancer cells due to their nano size and ability to penetrate individual cancer cells and high-resolution imaging. Carbon nanotubes (CNTs) are of interest to the medical community due to their unique properties in which they converting optical energy into thermal energy. Many research laboratories, are investigating the conjugation of QDs to CNTs to allow both localisation of the cancer cells in the patient, by imaging with QDs, and subsequent cell killing, via drug release from the CNT.

Method

SWCNTs were oxidised and reacted with OctaAmmonium POSS to render them more biocompatible and water dispersible. The functionalised SWCNTs were conjugated with QDs for cancer cell imaging. The composite were characterised by Fourier transform infrared spectroscopy (FTIR), Confocal microscopy, UV-VIS spectrometer, Transmission electron microscopy (TEM). The HT29 (colon) and MCF7 (breast) cancer cell line were used for cancer cell imaging.

Results

Post functionalization process of SWCNT with OctaAmmonium-POSS, TEM images showed a layer of dots had formed on the surface of the SWCNTs. In the FTIR and UV-Vis spectrometer experiments, result illustrated the presence of the amide bond following the conjugation of SWCNT to QDs in comparison to SWCNT and QDs only. Confocal microscopy picture determined the presence of fluorescence in both QDs and QDs conjugated SWCNT. The images obtained by confocal microscopy from HT29 and MCF7 cancer cell line determined the location of SWCNT in different parts of cancer cell at various time intervals

Conclusion

Treating pure SWCNTs with OctaAmmonium-POSS is an effective method for functionalization of SWCNTs. Attachment of QDs to SWCNT can be used to track the movement of SWCNT in in vivo studies.