Abstract

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Hydrothermal route derived L-Cysteine capped MgS quantum dots based optical sensor for the levofloxacin detection via photo induced electron transfer process

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Abstract

Rapidly developing antibiotics resistance in bacteria is rendering their usage ineffective for the treatment of various diseases. [1] Unmonitored use and unrestricted leakage of the antibiotics in the river streams as well as leaching into ground water are causes of major concern. [2] Thus, there is a need to develop new methods to detect the antibiotics present in the environment. [3] In this study, we have utilized L-Cysteine capped magnesium sulfide quantum dots (L-Cyst-MgS QDs) for the detection of Levofloxacin antibiotic. [4] Hydrothermal method was utilized to synthesise the L-Cyst-MgS QDs and further studied using Transmission electron microscopy study which showed monodispersed L-Cyst-MgS QDs of 2–4 nm in size. Elemental composition was studied using energy dispersive x-ray photoemission (EDX) spectroscopy study confirmed the formation of pure L-Cyst-MgS QDs. In optical study, UV-vis absorption study showed a peak centered around 340 nm while the photoluminescence study exhibited the maximum peak at 410 nm for 340 nm of excitation wavelength. Further, L-Cyst-MgS QDs was studied with thirteen antibiotics including Thiamphenicol, Gentamicin, Erythromycin, Ofloxacin, Ampicillin, Ciprofloxacin, Tetracycline, Chloramphenicol, Florfenicol, Amoxicillin, Moxifloxacin, Norfloxacin, and Levofloxacin. Significant changes were obtained for the levofloxacin interaction with the L-Cyst-MgS QDs. In the response study, MgS showed a continuous decrease, while Levofloxacin showed an increase with the concentrations (0–100 µg/ml) of Levofloxacin with linear behavior obtained in the range of 1–90 µg/ml. The limit of detection was found to be 0.21 µg/ml. Time-resolved fluorescence spectroscopy (TRFS) showed no change in lifetime for both the samples. The mechanism for the interaction of L-Cyst-MgS QDs with Levofloxacin can be explained based on the electron transfer from conduction band of L-Cyst-MgS QDs to the HOMO of Levofloxacin.

Biography

Tarun Kumar Dhiman has completed his M Tech in Guru Gobind Singh Indraprastha University in the field of Nano Science and Technology. Presently he is working as a Junior Research Fellow in Special Center for Nanoscience, New Delhi. He has done many publications in the field of Nanotechnology and Biosensors and also owns 2 Patents.

