PROBING TOXICITY OF QUANTUM DOTS CDSE/ZNS IN WATER ENVIRONMENT

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Abstract: Manufactured quantum dots (QDs) are increasingly used in variety of consumer products from modern electronics, optical technologies, and industries, to medicine. Different types of quantum dots (QDs) with varied chemical make-up could be produced to fit particular application. The toxic effects of QDs have not been fully characterized, but it is generally believed that they can have toxicological properties that differ from their bulk individual material they were made of. The individual QDs own unique physicochemical properties, such as size, chemical composition, shape and reactivity, which in turn determine their toxicological characteristics toward environment. In this work the overall toxicity of the CdSe/ZnS QDs added to simulated wastewater was investigated under controlled conditions. We have also studied the influence of UV radiation on processes and reactions that involved model organic contamination (benzene and toluene) in the presence of QDs as added impurity. The experiments were performed with samples containing 5 ppm of commercialized CdSe/ZnS (suspended in toluene) and phenol (50 ppm) as primary pollutant. Samples were irradiated in UV range up to 5 hrs. An aliquot of samples was withdrawn every 60 minutes and overall toxicity was measured. The toxicity was tested with biofix luminol 10 using vibrio fisher bacteria. Preliminary results have shown major differences in the toxicity between samples with and without CdSe/ZnS. In first hour of radiation samples containing CdSe/ZnS resulted with higher toxicity comparing with samples containing organic compounds only. During following hours (2 and 3 hours) toxicity varied depending on the make-up of sample and addition of quantum dots. By the end of irradiation process, toxicity of samples was high enough to kill 100% of tested bacteria. Different pattern of produced toxicity indicate changes in kinetics reactions, and types and concentration of by-products.

Keywords: Quantum dots, toxicity, UV radiation

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