Sensors as tools for quantitation and cytotoxicity studies of engineered nanomaterials

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The discovery of fullerenes in 1985 has ushered in an explosive growth in the applications of engineered nanomaterials and products. Some of the special properties that make nanomaterials useful may also cause them to pose hazards to humans and the environment. Positive cytotoxicity and genotoxicity have been reported for the water-soluble C_{60} aggregates (nC_{60}), despite its low hydrophobicity. Nanomaterials also offer new possibilities for the development of novel sensing and monitoring technologies. Nanosensors can be classified under two main categories[1]: (1) sensors that are used to measure nanoscale properties; and (2) sensors that are themselves nanoscale or have nanoscale materials or components. The first category can enhance our understanding of the potential toxic effects of industrial pollutants. This is an area of critical interest to detection and risk assessment, as well as for monitoring of environmental exposure[1,2]. The second category can eventually result in lower material cost, reduced weight and power consumption[3]. In this presentation, the first category of sensors will be described as an example of ultrasensitive portable UPAC sensor for monitoring the cytotoxicity of engineered nanomaterials including fullerenes, dendrimers and metal nanoparticles. The presentation will also involve the second category of sensors focusing on the mechanism of molecular recognition, material design and characterization, sensing efficiency as well as potential application for improving environmental quality.

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