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For presentation at the 227th ACS Meeting
March 28- April 1, 2004
Anaheim, CA

Fluorescent and Microcantilever Sensors for Cesium and Strontium

This research was funded by the Environmental Remediation Sciences Division, Office of Biological & Environmental Research, Environmental Management Science Program, U.S. Department of Energy, under contract No. DE-AC05-00OR22725 with Oak Ridge National Laboratory, managed and operated by UT-Battelle, LLC for the USDOE.

Fluorescent and Microcantilever Sensors for Cesium and Strontium

Fluorescent and microcantilever-based sensors, utilizing a molecular recognition element, are being developed for cesium and strontium. These sensors will be needed for real-time application in the characterization of DOE's nuclear waste and waste process streams. Molecular recognition with these sensors is achieved using ionophores constructed with the three-dimensional architecture provided by calix[4]arenes, a widely used platform for metal ion complexation. Fluorescent sensors utilize a fluorophore group that responds to metal ion complexation. Anthracene, dansyl, coumarin, and pyrene have been covalently attached to calixarenes and investigated as fluorophores. Upon complexation of the metal ion by the ionophore, the above fluorophores signal complexation by a change the fluorescence intensity. Microcantilever sensors utilize a Si or SiN cantilever coated on one side with gold. Calix[4]arenes containing the covalently attached ionophore are substituted with alkane thiols which form a self-assembled monolayer on the gold surface. Microcantilevers undergo bending due to mechanical forces involved in molecular adsorption, particularly when adsorption is confined to one surface of the cantilever. Complexation of the metal ions by the ionophore causes the cantilever to bend. The development of selective ionophores and their application to fluorescent and microcantilever sensors will be discussed.