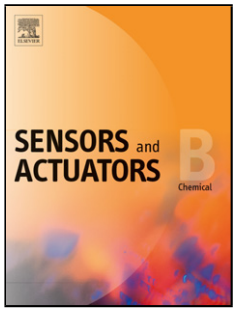

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Detection of cadmium ion in aqueous medium by simultaneous measurement of piezoelectric and electrochemical responses

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HIGHLIGHTS

- Detection of cadmium ion in aqueous medium using film of octadecylamine functionalized CNTs
- Experimental setup for recording piezo and electrochemical responses simultaneously
- Lowest detectable concentration of cadmium ion was 5 ppb
- The response curves were found to be linear in the given concentration range
- Modulation of piezoresponse indicates the interfacial phenomenon of adsorption and desorption of the analyte
- Morphological changes were observed due to adsorption of the analyte on the functionalized layer

Abstract

Cadmium is one of the important heavy metals which poses health hazards due to its consumption through potable water. Cadmium is known to form complexes with amine group and also it has good affinity towards carbon nanotubes. The octadecylamine functionalized single-walled carbon nanotubes (ODACNTs) can be employed for sensing cadmium ion in aqueous medium. A thin film of ODACNTs offers not only strong adsorption properties towards cadmium ion but also provides an enormous gain in surface to volume ratio, and good mechanical and chemical stability. Therefore, a sensing layer of ODACNTs was formed on the gold deposited quartz wafer and the sensing towards cadmium ion in the aqueous medium was performed. An experimental setup was designed to record the electrochemical and piezo-responses simultaneously. The piezo and electrochemical responses were found to be linear in the given concentration range. Interestingly, the piezoresponse modulates systematically and repeatedly from a maximum to minimum value due to voltage sweep during cyclic voltammetry indicating the interfacial phenomenon of adsorption and desorption.

Keywords: Octadecylamine functionalized single-walled carbon nanotubes, cadmium, piezoresponse, electrochemical response, FESEM.