

## Field Demonstration of a Microcantilever Sensor for Monitoring Mercury in Water

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We report the development and testing of a stand-alone, fieldable microcantilever-based sensor for the measurement of the mercury concentration in water. Gold-coated microcantilever sensors are ideally suited for real-time, remote, long-term monitoring of the concentration of mercury in surface water or groundwater. Mercury in groundwater and surface water is a pervasive problem at DOE's Y-12 National Security Complex in Oak Ridge, where the contaminant is being mobilized from soils and sediments and moving off-site via surface water. Regulators are pressing DOE to reduce the concentration of Hg in surface water that leaves the site to <200 parts per trillion level, and the ability to detect and monitor this heavy metal to such levels is key. A silicon or silicon nitride microcantilever, coated on one side with a thin layer of gold, has been shown in previous publications to bend when exposed to small concentrations of either mercury vapor or Hg(II) ions in solution, because the mercury spontaneously amalgamates with the gold, stressing the thin film and causing the microcantilever to bend. In this paper we describe the design of a portable, two-cantilever system with provisions for the flow of ground or surface water through the cantilever chip liquid cell. Cantilever deflection is determined optically in a rugged design that requires 120V power (a battery powered unit will be tested if time permits) and a laptop computer for operation. Pretreatment schemes for the water entering the microcantilever sensor will be described.

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