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Entitled

DESIGN, FABRICATION, AND CHARACTERIZATION OF HG^{2+} SENSOR BASED ON GRAPHITE OXIDE AND METALLIC NANOCLUSTERS

by

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Abstract

It has been previously demonstrated that improving the detection of mercury (Hg^{2+}) in water is of significant importance since the Hg^{2+} has detrimental effects on human health and could lead to toxicity, especially in utero. One way this could be achieved is through the design of highly sensitive and selective sensors for Hg^{2+} contents in water. In this work, it is hypothesized that sensors with silver nanoclusters enhance the sensitivity of the fabricated sensor and possess the highest selectivity to the Hg^{2+} detected in this study. In order to verify this hypothesis, sensors with silver decorated nanoclusters were designed and then tested their selectivity and sensitivity to Hg^{2+} in water. These sensors were designed by utilizing a thermal evaporation process; interdigitated electrodes of gold were deposited on the surface of the sensor substrate. Then, graphite oxide (GO) was placed between these electrodes. Subsequently, silver nanoclusters were deposited on top of the GO using magnetron sputtering and inert gas condensation system. The sensitivity to Hg^{2+} in water was tested for sensors decorated with Ag by subjecting them to different concentrations of the ion in water. As for the selectivity to Hg^{2+}, it was investigated by subjecting the sensors to various ions. The results of these experiments demonstrate that the sensor based on GO decorated with Ag has a high sensitivity and selectivity to Hg^{2+} in water. It is therefore recommended to use these sensors in practical applications. Moreover, a readout circuit was built to convert the changes in sensing currents to numerical values. The circuit was simulated using PSpice simulation software.

Keywords: Graphite oxide, Silver nanoclusters, Mercury sensor, Inert-gas condensation.