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Silver Nanowires Functionalized Graphene Oxide Based Biosensor for Trace level Detection of Mercury Ions MD TAWABUR RAHMAN, MD ASHIQUR RAHMAN LASKAR, Department of Electrical Engineering and Computer Science, South Dakota State University, Brookings, SD 57007, USA, ABDULLAH AL MARUF, Department of Physics, South Dakota State University, Brookings, SD 57007, USA, QIQUAN QIAO, Department of Electrical Engineering and Computer Science, South Dakota State University, Brookings, SD 57007, USA — This work presents a highly selective and sensitive electrochemical biosensor for the detection of trace amount of mercury (Hg^{2+}) in water. Silver nanowires (AgNWs) functionalized graphene oxide (GO) modified glassy carbon electrode was used for the determination of Hg^{2+} utilizing anodic stripping voltammetry. An excellent sensitivity of 36.3 microampere per micromolar with linear detection range of 0.6 – 1.4 micromolar toward Hg^{2+} were obtained. The synergistic effect of GO and AgNW was utilized to enhance the sensitivity and selectivity of the sensor. The limit of detection was found to be 0.7989 nanomolar, which is well below the safety limit of Hg^{2+} in drinking water defined by World Health Organization. In addition, the sensor exhibited good selectivity for Hg^{2+} compared to other heavy metal ions including Pb^{2+} , Cd^{2+} , Cu^{2+} , Cr^{3+} , Ag^+ , etc. The superior performance of the developed sensor can be attributed to the large surface area of GO and conductivity of AgNWs. Further, the developed sensor demonstrated high accuracy for the detection of Hg^{2+} in tap water, recommending the applicability for on-site monitoring of Hg^{2+} in water.

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