A Reduced Graphene Oxide/Gold Nanoparticles Composite Modified Glassy Carbon Electrode as Electrochemical Sensor for Calcium Ions Detection in Bottled Water

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The present study suggested an ultrasensitive reduced graphene oxide (rGO)/gold nanoparticles (AuNPs) modified electrochemical sensor for the detection of trace Ca^{2+} ions in bottled water. The detection was performed by the aid of calcium ligand complexing agent ethylenediaminetetraacetic acid (EDTA). The presence of rGO as a large surface area and supporting material to AuNPs provides a facile electrochemical reduction of Ca^{2+} -EDTA in the presence of ammonia buffer of pH = 10. Under optimized experimental conditions, the fabricated sensor displayed excellent linearity over a concentration range of 2 – 100 $\mu\text{g mL}^{-1}$ ($r = 0.999$) with calculated detection and quantification limits of 0.01 and 2 $\mu\text{g mL}^{-1}$ for Ca^{2+} , respectively. The fabricated modified sensor was unaffected by the presence of certain possible common interfering species. Using ICH guidelines the proposed method was validated with respect to various analytical parameters including, linearity, detection and quantification limits, precision, accuracy, etc. Moreover, a comparative analytical study for calcium detection using the proposed electrochemical method and other analytical methods was carried out. It revealed good reproducibility, repeatability and success in the detection of trace Ca^{2+} ions in different brands of bottled water.

Keywords: Graphene oxide nanoparticles; Gold nanoparticles; Bottled water, Modified sensor; Ca^{2+} .

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