

## **Amalgamation based optical and colorimetric sensing of mercury (II) ions with silver@graphene oxide nanocomposite materials**

### **ABSTRACT**

The article describes a facile method for the preparation of a conjugate composed of silver nanoparticles and graphene oxide (Ag@GO) via chemical reduction of silver precursors in the presence of graphene oxide (GO) while sonicating the solution. The Ag@GO was characterized by X-ray photoelectron spectroscopy, X-ray powder diffraction, and energy-dispersive X-ray spectroscopy. The nanocomposite undergoes a color change from yellow to colorless in presence of Hg(II), and this effect is based on the disappearance of the localized surface plasmon resonance absorption of the AgNPs due to the formation of silver-mercury amalgam. The presence of GO, on the other hand, prevents the agglomeration of the AgNPs and enhances the stability of the nanocomposite material in solution. Hence, the probe represents a viable optical probe for the determination of mercury(II) ions in that it can be used to visually detect Hg(II) concentrations as low as 100  $\mu$ M. The instrumental LOD is 338 nM.

**Keyword:** Silver nanoparticles; X-ray photoelectron spectroscopy; X-ray powder diffraction; Energy-dispersive X-ray spectroscopy; Localized surface plasmon resonance