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Tailoring Of Poly(N-Methyl Pyrrole) Thin Film Surface With Au-Nanoparticles For Selective Sensing Of H₂S

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Abstract

We have demonstrated a highly selective H₂S sensor fabricated out of Au-nanoparticles decorated Poly (N-Methyl Pyrrole) thin film. Electrochemical process parameters were initially optimized for uniform deposition of Poly (N-Methyl Pyrrole) on planar platinum substrate. Single step chronopotentiometric deposition resulted in a uniform and adhesive polymeric matrix which served as the basic sensing

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tailored with Au nanoparticles via cyclic voltammetry. Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Analysis (EDAX) and FTIR spectroscopy were carried out to investigate morphological and structural aspects of the sensory material. The semiconductive regime of operation of the sensor was revealed by V-I characterization. Comparative investigations clearly indicated inclusion of Au nanoparticles resulted in better sensing behaviour than pristine polymeric matrix. Most interesting results were obtained on validating the sensor under independent atmospheres of NH₃, NO₂, SO₂, and H₂S where the sensor reflected fingerprinting of H₂S. Successful detection of H₂S with commendable response and recovery behaviour was possible down to concentration of 5 ppm. The overall sensing behaviour of the nanoparticles tailored polymeric matrix could open up opportunities for complex sensing platforms like e-noses.

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