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Tailoring Of Poly(N-Methyl Pyrrole) Thin Film Surface With Au-Nanoparticles For Selective Sensing Of H_2S

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Abstract

We have demonstrated a highly selective H_2S 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 platform. To inculcate selectivity to the synthesized sensor backbone, the polymeric surface was

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 NH_3, NO_2, SO_2, and H_2S where the sensor reflected fingerprinting of H_2S. Successful detection of H_2S 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.

Previous article in issue

Next article in issue