

SYNTHESIS AND CHARACTERIZATION OF THIN FILMS OF COBALT ON POLYANILINE FILMS

N.J. Punchihewa

Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka
Department of Chemistry, University of Peradeniya, Peradeniya, Sri Lanka

Thin films of Polyaniline doped with sodium dodecyl sulfate (NaDS) have been synthesized on a surface of gold coated polythene using electrochemical polymerization technique. Thin films of cobalt have been synthesized by the electrodeposition method using the previously synthesized Polyaniline thin films as the substrate material. Synthesis of Polyaniline doped with dodecyl sulfate films (PANI-DS) was carried out by electrochemical polymerization of 0.5 M aniline by applying a constant current density of 1 mA cm^{-2} using the galvanostat for 10 minutes in an aqueous solution containing 0.5 M H_2SO_4 and 0.05 M NaDS. Surface of gold coated polythene with dimensions $0.5 \text{ cm} \times 2.0 \text{ cm}$ was used as the substrate material for the electro polymerization of aniline monomers.

PANI-DS films were used as substrate material for the electrodeposition of cobalt metal using an aqueous solution containing $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$. The electrodeposition of metal ions was performed by applying a constant current density of 0.5 mA cm^{-2} . The concentration of $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ and the deposition time were varied to optimize the deposited cobalt percentage on the PANI-DS films. The effect of supporting electrolytes such as KCl and NaCl on the deposition of the cobalt was also investigated. X-ray fluorescent spectroscopy and X-ray diffraction spectroscopy were carried out in order to determine the amount of the deposited material and to identify the materials. Morphological properties of the thin films have been investigated using scanning electron microscopy.

Deposited cobalt on polyaniline thin films increased with the deposition time for same CoCl_2 concentration and after five hours of deposition, the deposited cobalt amount saturates and further increase of time does not increase the deposited cobalt amount significantly. The increase of CoCl_2 concentration from 0.1 M to 0.6 M increases the deposited cobalt amount. The deposition of cobalt with the presence of supporting electrolytes such as NaCl and KCl has been shown to increase the deposited cobalt amount. Both NaCl and KCl show the same effect on the deposited cobalt amount.