

Synthesis and Study of Properties of Polyaniline/Nickel Sulphide Nanocomposites

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Abstract : This work is on the synthesis and study of the optical characterization of polyaniline/nickel sulphide nanocomposite. Polyaniline (PANI) and nickel sulphide (NiS) nanoparticles were synthesized by oxidative chemical polymerization and sol-gel method. The polyaniline nickel sulphide nanocomposites with various concentrations of NiS were synthesized by in-situ polymerization of aniline monomer. In each case, the nickel sulphide nanoparticles were uniformly dispersed in the aniline hydrochloride before the initiation of oxidative chemical polymerization using ammonium persulphate. The samples formed were subjected to optical characterization using an ultraviolet (UV)-visible light (VIS) spectrophotometer (model: 756S UV - VIS). Optical analysis of the synthesized nanoparticles and nanocomposites showed absorption of radiation within VIS regions. The Tauc model was used to obtain the optical band gap. Energy band gap values of PANI and NiS were found to be 2.50 eV and 1.95 eV, respectively. PANI/NiS nanocomposites has an energy band gap that decreased from 2.25 eV to 1.90 eV as the amount of NiS increased (from 0.5g to 2.0g). These optical results showed that these nanocomposites are potential materials to be considered in solar cells and optoelectronics devices. The structural analysis confirmed the formation of polyaniline and hexagonal nickel sulphide with an average crystallite size of 25.521 nm, while average crystallite sizes of PANI/NiS nanocomposites ranged from 19.458 nm to 25.108 nm. Average particle sizes obtained from the SEM images ranged from 23.24 nm to 51.88 nm. Compositional results confirmed the presence of desired elements that made up the nanoparticles and nanocomposites.

Keywords : polyaniline, nickel sulphide, polyaniline-nickel sulphide nanocomposite, optical characterization, structural analysis, morphological properties, compositional properties

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