Abstract

This study explores the preparation and characterization of nickel cobalt sulfide thin films with varying volumetric concentration of cobalt sulfide and nickel sulfide (1:0, 3:1, 1:1, 1:3, 0:1), the films were successfully deposited on glass substrate preheated at 350°C by home built spray pyrolysis technique known for its simplicity, accessibility and cost effectiveness. The influence of Co and Ni content on various physical properties of thin films were inspected by using Fourier transform infrared spectroscopy (FTIR), Raman spectroscopy, UV-VIS spectrophotometer, Photoluminescence spectroscopy, contact angle measurement and vickers hardness testing. FTIR spectra portray characteristic absorption band centered at around 670, 750, 870 and 1095 cm^{-1} corresponding to metal sulfur bonds. Raman spectra exhibited characteristic peaks at 470, 530, 680cm^{-1} confirming the formation of metal-sulfur bonds with A_{1g} and F_{2g} vibrational mode. The optical properties of thin films were investigated via UV-Vis spectrophotometer which showed high absorbance in the UV and visible region across all samples. An increase in Ni concentration resulted in decrease in optical band gap. PL spectroscopy revealed emission peaks in all the five samples at around 710nm and 880nm. The contact angle measurement indicated the hydrophilic nature of the thin films. Vickers hardness testing demonstrated increased hardness with higher Ni content in nickel cobalt sulfide thin films, highlighting the material's enhanced mechanical strength as nickel concentration increases.