**Abstract**

Structural and Optical properties of undoped and Al doped Cu2S nanoparticles prepared by Hydrothermal method are studied. The nanoparticles of the obtained pure and Al doped(1%, 3%, 5%, 7% and 9% of Al concentration) Cu2S have been characterized by the XRD, SEM-EDOX and FTIR techniques. The XRD analysis reveals that all the obtained samples exhibit polycrystalline nature. Increasing the degree of crystallinity improves the physical properties of the nanoparticles. The photovoltaic studies show that the obtained nanoparticles have high photocurrent density.