

## Abstract

The energy crisis is a global concern these days. Many research groups are active to gain more output from conventional energy sources. Fuel cells are green sources of energy, and scientists are trying to increase their efficiency by introducing different techniques. Delafossites are  $ABO_2$  type minerals being widely used in solar cell engineering. But in certain applications, especially in the environment of magnetic fields, the magnetic characteristic reduces their biasness. We aim to tailor Delafossites with softer magnetic characteristics. In this work nanocomposites, based upon Cr-doped  $CuFeO_2$  were synthesized using the micro-emulsion method in the doping range of 2%, 4%, 6%, 8%, and 10%. The prepared samples were characterized and results confirmed the existence of a prepared sample with nano-crystallite size. The crystallite size varies between 31.35 to 23.35 nm. FESEM gave the results of surface morphology which was per required results. The average grain size is found between 172 and 45 nm. FTIR confirms the sharp peak at  $408.11\text{ cm}^{-1}$ , broad absorption at  $1079.65\text{ cm}^{-1}$ , and less intensive band at  $1018.4\text{ cm}^{-1}$ . The sharp vibration peak of the sample at  $585.96\text{ cm}^{-1}$  band is related to Fe-O magnetite showed a level of purity. EDX confirms the qualitative and quantitative contents of pure and Cr-doped  $CuFeO_2$ . VSM results illustrated that the crystal structure of pure and Cr-doped  $CuFeO_2$  that the saturation magnetization is decreased by increasing the doping of Cr ions. PL results showed that the bandgap increased by increasing the Cr-doping.