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Magnetic properties and chemical state of nickel doped CuFeO_2 delafossite oxide powders prepared by sol-gel method

Nickel doped CuFeO_2 were synthesized by using sol-gel method and then heat annealing was performed into two steps. The first annealing was executed at 500°C in air to transform the dried gels into spinel oxide phases and the second one was done at 800°C in argon for the formation of delafossite oxide phase. The chemical and crystal structure and morphology of dried gels and annealed powders were characterized by FT-IR, XRD and XRF while the morphology of nanostructure of annealed delafossite oxide was observed by SEM image. Magnetic properties were measured by vibrating sample magnetometer. The $\text{CuFe}_{1-x}\text{Ni}_x\text{O}_2$ ($x = 0.01-0.05$) samples exhibited a weak ferromagnetic behavior and a linear paramagnetic behavior upon hysteresis was observed. The undoped powder cannot be observed the magnetic hysteresis however small kink can be observed. In addition, chemical state of delafossite oxide was also studied from the modification of valence states near Cu, Fe and Ni k-edges.

Keyword: Sol-gel method, magnetic properties, XAS, delafossite oxides

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