

Magnetic and dielectric characteristics of $\text{Cu}_x\text{Mg}_{0.6-x}\text{Zn}_{0.4}\text{Fe}_2\text{O}_4$ ($x=0-5$) thin films

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Abstract

In this study copper substituted MgZn ferrite $\text{Cu}_x\text{Mg}_{0.6-x}\text{Zn}_{0.4}\text{Fe}_2\text{O}_4$ ($x=0-5$) thin films were prepared by sol-gel processing. Correlation between structural characteristics, dielectric and magnetic properties are investigated. X-ray diffraction (XRD) patterns of the samples indicate the formation of single-phase cubic spinel structure. AFM micrographs demonstrate that both grain size and surface roughness of the thin films with Cu substitution were bigger than those of the film without substitution (Fig. 1). Figure 2 shows that with increasing Cu content in the spinel structure the saturation magnetization are increased. Copper content has significant influence on the magnetic properties, such as initial permeability, quality factor, DC resistivity, dielectric constant and dielectric loss tangent as well as their effective magnetic susceptibility. The low loss values at higher frequencies show the potential of these samples for high frequency applications. The possible reasons that are responsible for the composition dependence of main magnetic properties will be discussed.

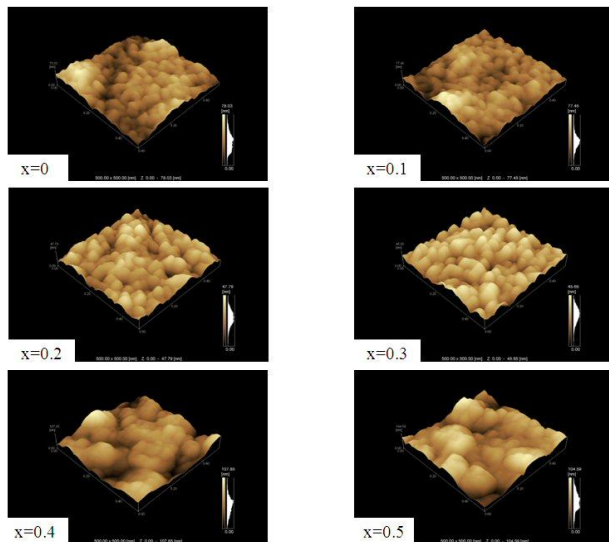


Fig. 1. AFM micrographs of prepared thin films

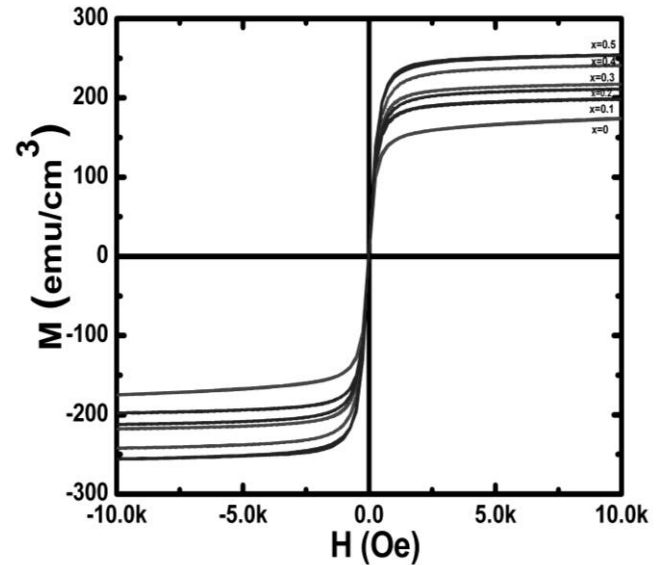


Fig. 2. VSM graphs of prepared films

Reference:

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