

26th National Symposium on Cryogenics and Superconductivity

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Low temperature magnetic properties of Cu-Zn ferrite thin films

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Content :

Copper zinc ferrite (CZF) target with composition $\text{Cu}_{0.8}\text{Zn}_{0.2}\text{Fe}_2\text{O}_4$ was used to deposit thin films of thickness ~ 650 nm using RF-magnetron sputtering in argon gas at 12 mTorr pressure. The as deposited films were heat treated using hydrothermal process at 453K for 10 hours and dried at 323 K. The field emission scanning microscope show the formation of larger nano-clusters in surface view and columnar structure in cross-sectional view for the as synthesized films, The micrographs of hydrothermal films are more homogeneous. This is attributed to the rearrangement of pre-existing clusters with hydrothermal treatment. The magnetization vs. magnetic field ($M(H)$) plots of the as deposited and hydrothermal heated films at 300K show that the films with hydrothermal heat treatment has more saturation magnetization compared to the as deposited films. This indicates the directional or structural similarity of clusters in hydrothermal films. The $M(H)$ plots at 5K show increase in saturation magnetization for both as deposited and the hydrothermal treated films due to ferromagnetic cluster formation at lower temperatures. The temperature dependent magnetization $M(T)$ plots in the temperature range 5-350 K show FC-ZFC splitting for both the films with irreversible temperature (T_{irr}) shifting towards lower temperatures for hydrothermal treated films.

Summary :

Structural parameters of nano-clusters tune the low temperature magnetic properties of Cu-Zn Ferrite thin films.

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