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Abstracts

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Magnetic properties of $FeGa_2O_4$ thin film

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$FeGa_2O_4$ exhibits interesting magnetic properties, such as spin-freezing, spin-glass phase, spin-disorder, and frustration effects. $FeGa_2O_4$ is inverse spinel with long-range ordering at low temperature. Especially $FeGa_2O_4$ show the presence of superparamagnetic clusters behavior at low temperature. The magnetic properties of thin film $FeGa_2O_4$ grown by using pulsed-laser deposition (PLD) have been studied and compared with powder, and single crystal of $FeGa_2O_4$.

Magnetic thin film of $FeGa_2O_4$ was grown onto MgO (100) substrate by PLD using $FeGa_2O_4$ target and excimer laser with $\lambda = 248$ nm at a repetition rate of 2 Hz and a fluence of 20 mJ. The substrate temperature was at 600 °C with hydrogen pressure 1.0×10^{-5} Torr. The resulting thin film of $FeGa_2O_4$ was confirmed to be single phase with a spinel structure and lattice constant $a_0 = 8.34$ Å. Magnetic measurements were carried out by superconducting quantum interference device (SQUID) magnetometer. The temperature dependent zero-field-cooled (ZFC) and field-cooled (FC) magnetization curves under the 400 Oe show no anomaly from 2 to 300 K as in paramagnetic phase. However the hysteresis-loops at 20, 100, and 300 K are appeared to be ferrimagnetic as shown in Fig. 1. In $FeGa_2O_4$ powder, it is reported that superparamagnetic behavior is caused by small ferrimagneitc clusters above 15 K.

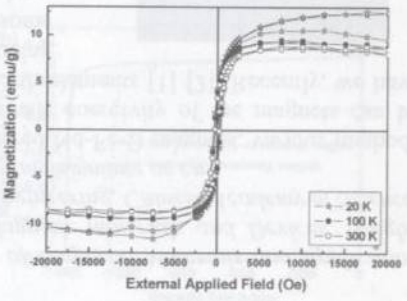

Figure 1. Magnetization - hysteresis (M-H) curves at 20, 100, and 300 K for thin film of $FeGa_2O_4$.