Ferromagnetic resonance study on Y-type hexaferrite $Ba_{0.5}Sr_{1.5}Zn_2Fe_{12}O_{22}$

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Hexaferrites have attracted considerable interests as the variety of structural and chemical variations which enable a large degree of flexibility in their magnetic phases. It has been reported $Ba_{0.5}Sr_{1.5}Zn_2Fe_{12}O_{22}$ shows magnetically induced ferroelectricity and a magnetoelectric effect related to modifications of a spiral magnetic structure by applying a magnetic field.[1] The magnetic structure in the ferroelectric phase is stabilized only in the intermediate magnetic field regime (intermediate-III phase) and does not seem to essentially differ from the nonpolar phase in the lower magnetic field (intermediate-II phase). Observation of any subtle difference in the intermediate magnetic phases can be invaluable in understanding microscopic mechanism of the magnetically induced ferroelectricity in $Ba_{0.5}Sr_{1.5}Zn_2Fe_{12}O_{22}$.

In this study, single crystals of $Ba_{0.5}Sr_{1.5}Zn_2Fe_{12}O_{22}$ are grown from Na_2O-Fe_2O_3 flux and we employed vector network analyzer ferromagnetic resonance (VNA-FMR) to investigate the magnetic phase diagram of $Ba_{0.5}Sr_{1.5}Zn_2Fe_{12}O_{22}$. Fig. 1(a) shows FMR spectra with increasing field at 100K. By employing the VNA-FMR analysis, we found new magnetic dynamic phases within the intermediate-II state. (We refer to the phases as intermediate-IIA and -IIB phases.) In the two phases, distinguishable VNA-FMR spectra were obtained, as shown in Fig. 1(b).

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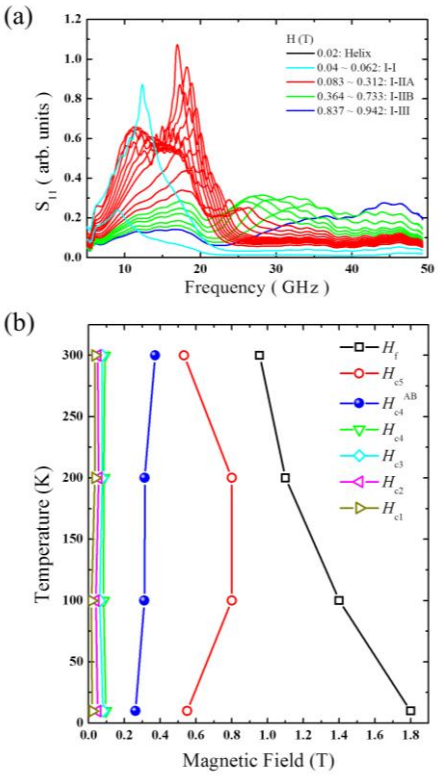

Fig. 1 (a) FMR spectra at 100K

(b) Magnetic Phase diagram

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