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Low temperature magnetic properties of ferrimagnetic and ferroelectric composites

Content :

Multiferroic exhibit interplay between electric, magnetic and elastic behaviour of the material as a function of composition. The multiferroic composites were synthesized using the nanoparticles of Mn-Zn ferrite (MZF) and $BaTiO_3$ (BTO) with different composition ratio by sintering at 1200°C for 6 hours. The X-ray diffraction and field emission surface electron micrographs confirm the coexistence of ferrimagnetic (FM) and ferroelectric phases (FE). The magnetization plots (M(H)) of the composites at 5 K show high coercivity of ~ 800G compared to the value of ~ 10G for MZF. The magnetization decreases with the inclusion of diamagnetic BTO in MZF. The variation of magnetization at 5 and 300 K is related to the variation in grain size of FE inclusions in the composites. The temperature dependent magnetization (M(T)) plots were recorded from 5 to 350 K in zero field cooled and field cooled modes. The M(T) plot of MZF shows long range ferrimagnetic order whereas for composites it shows short-range magnetic order. The significant change in M(T) values are observed with the inclusion of FE ions in FM ordered system. The dielectric constant and loss values of FM-FE composites decrease with increase in frequency and approaches a low saturation value at high frequencies.

Summary :

The X-ray diffraction and field emission surface electron micrographs confirm the coexistence of ferrimagnetic and ferroelectric phases (FE).The magnetic data shows the effect of ferroelectric phase inclusion in ferrimagnetic phase.

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