Optimising the frequency dependent properties of Mn ferrite by the variation of sintering temperature

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Abstract

Mn ferrite (MnFe2O4) is an essential magnetic material for high frequency devices. To optimize the better performance of Mn ferrite, MnFe2O4 chemical compositions are sintered at five different temperatures (TS =500 ◦C, 700 ◦C, 850 ◦C, 1000 ◦C, and 1200 ◦C) by the co-precipitation method. The structural parameters, such as lattice parameter, lattice strain, crystallite size of the ferrites are studied by the X-ray diffraction process. The grain size of the ferrites is scanned by an electron microscope, where the grain size gradually increases with the heat treatment. Applied AC frequency dependent magnetic and dielectric properties are studied in a long frequency range (100 Hz–100 MHz). The magnetic analysis shows that the magnetic permeability and magnetic quality factor are better for higher heat-treated Mn ferrites. On the other hand, dielectric measurements show that the lower heat-treated samples are better for high dielectric constant and low dielectric loss. Finally, this article tries to summarize the optimum performance of Mn ferrites for high frequency devices on the basis of sintering temperature.

Keywords: Mn ferrite, Co-precipitation method, Grain size, Permeability, Dielectric constant