Magnetic Properties of Sr Substituted Y-Type Hexaferrite

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With the recent advances in high frequency antennas and RF devices requiring miniaturization, broad bandwidth, and impedance matching, magnetic material such as hexaferrites with high resonance frequency have been studied extensively. Here, we synthesized the Y-type hexaferrites ($Ba_{2-x}Sr_xCo_{2-y}Zn_yFe_{12}O_{22}$) by solid state reaction method and investigated their crystalline and magnetic properties by XRD, VSM, Mössbauer spectrometer and network analyzer. XRD patterns show that $Ba_{2-x}Sr_xCo_{2-y}Zn_yFe_{12}O_{22}$ samples have rhombohedral structures with space group $R\text{-}3m$. The VSM measurements show that the Zn substitution decreases the Néel temperature significantly while the Sr substitution does not. However, the spin reorientation temperature, corresponding to non-collinear helical to collinear ferrimagnetic transition, of $Ba_{2-x}Sr_xCo_{2-y}Zn_yFe_{12}O_{22}$ increased with Sr concentration. Complex permeability and permittivity of $Ba_{2-x}Sr_xCo_{2-y}Zn_yFe_{12}O_{22}$ samples were measured by network analyzer between 100 MHz to 4 GHz. Our study shows that the permeability of $Ba_{2-x}Sr_xCo_{2-y}Zn_yFe_{12}O_{22}$ $(x = 0, y = 0.4)$ sintered at 1100°C is 2.38 at 2.45 GHz with $\tan\delta_\mu \leq 0.1$. Our experimental observation shows the potential application of $Ba_{2-x}Sr_xCo_{2-y}Zn_yFe_{12}O_{22}$ in RF devices in UHF band.

Index Terms—**Cation occupancy, Mössbauer spectroscopy, Y-type hexaferrite.**