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Aluminum and chromium substituted Y and Z-type hexaferrites for electromagnetic shielding interference and microwave absorber applications

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The tremendous augment in wireless and cell phone communication has raised the prerequisite of material used for the fortification of human being and electrical equipment against electromagnetic shielding interference EMI. Technological requirement for the same is that the Shielding Effectiveness parameter (SE) should be greater than 30 dB. Based on this requirement, the nanomaterials of Y-type hexaferrites $Ba_2 Mg_2 Alx/_2 Crx/_2 Fe_{12-x} O_{22}$ (x=0, 0.5, 1.0) and Z-type hexaferrites $Ba_3 Cu_2 Alx/_2 Crx/_2 Fe_{24-x} O_{41}$ (X=0.0, 0.5, 1.0) doped with aluminium and chromium have been prepared using sol gel auto combustion method. The structural and magnetic properties of prepared samples have been verified using XRD, FTIR and VSM. The XRD pattern confirms the formation of Y and Z-type hexaferrite. The FTIR spectrum indicates the presence of attached functional groups or molecular bands. Two bands have been observed in the range of 400-600 cm^{-1}. From M-H loops, saturation magnetization (Ms), coercivity (Hc) and retentivity of synthesized samples have been calculated. The radiation absorbance investigation in the microwave X-band (8-12.5 GHz) region using VNA shows the maximum radiation loss of -31.19 dB (99.99% loss) at frequency 11.14 GHz for $Ba_3 Cu_2 Alx/_2 Crx/_2 Fe_{24-x} O_{41}$ with x=0.5 and -37.25 dB (99.999% loss) for $Ba_2 Mg_2 Alx/_2 Crx/_2 Fe_{12-x} O_{22}$ (x=0). So, these nanomaterial materials have good reflection loss values which make it commercially enable for the communication and microwave devices applications.

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