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Modulation of physico-chemical, magnetic, microwave and electromagnetic properties of nanocrystalline strontium hexaferrite by Co-Zr doping synthesized using citrate precursor sol-gel method

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Abstract: Co-Zr doped $\text{SrCo}_x\text{Zr}_x\text{Fe}_{(12-2x)}\text{O}_{19}$ ($x = 0.0, 0.2, 0.4, 0.6, 0.8$ and 1.0) have been synthesized by citrate precursor sol-gel method. We have studied the impact of coupled substitution of magnetic Co^{2+} and non-magnetic Zr^{4+} for Fe^{3+} on the morphology, magnetic, microwave and electromagnetic properties of $\text{SrCo}_x\text{Zr}_x\text{Fe}_{(12-2x)}\text{O}_{19}$. Characterization of these materials has been done by XRD, FT-IR, EDS, TEM, VSM and Mössbauer spectroscopy techniques. Complex permeability (μ'), complex permittivity (ϵ') and reflection loss curves have also been analyzed. XRD analysis indicates the formation of single phase hexagonal ferrites at a low temperature of 800°C . Mössbauer spectra indicates that the dopant ions are located on the tetrahedral $4f_1$ and octahedral $4f_2$ sites up to $x = 0.4$, octahedral $12k$ site and bipyramidal $2b$ site for $x = 0.6$ and $12k$ site for $x = 0.8-1.0$. The reflection loss (R.L.) analysis shows that all the

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