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Comprehensive study of chemical synthesis and dielectric parameters of holmium substituted yttrium iron garnets ($\text{Ho}_x\text{Y}_{3-x}\text{Fe}_5\text{O}_{12}$, $x=0.1, 0.3, 0.6, 0.9, 1.2, 1.5$) prepared by conventional ceramic method

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YIG (yttrium iron garnet) is magnetic ferrite having chemical formula $\text{Y}_3\text{Fe}_5\text{O}_{12}$ and high resistivity. Substituted YIGs have formula $\text{R}_x\text{Y}_{3-x}\text{Fe}_5\text{O}_{12}$, where R represents rare earth elements. Polycrystalline cylindrical (13 mmx3.3 mm) six samples of holmium substituted YIG ($\text{Ho}_x\text{Y}_{3-x}\text{Fe}_5\text{O}_{12}$) were prepared by conventional ceramic technique. Powder samples were annealed at 1000°C (1 hour) and these were called green powders. The crystalline structure and dielectric properties of samples were studied by D8 Discover X-Ray diffractometer and Wayne Kerr impedance analyzer. Microstructural properties like crystallite size, dislocation density, micro-strain were calculated using XRD data. Increase in crystallite size was observed with the increase of holmium composition. Decreasing trend in dislocation density was observed with the increasing holmium contents. Dielectric parameters were studied with reference to changing holmium composition and changing frequency comprehensively. Both dielectric constant (ϵ') and dielectric loss (ϵ'') decreased sharply with the increase of frequency at room temperature (300k). The decreasing trend in dielectric parameters was observed with the increase in holmium contents. This series of substituted YIG having small dielectric constant, low dielectric loss and negligible tangent loss can play the most vital role in many electronic devices in microwave region. Small dielectric parameters exhibited by these prepared magnetic garnets make them highly useful in telecommunication and defense industry.

Biography

Kausar Javed Khan has completed her PhD from Lahore College for Women University, Lahore, Pakistan. During PhD studies, she has prepared magnetic garnet series. She has done her MPhil in Solid State Physics from Centre of Excellence at Punjab University, Lahore, Pakistan. She currently holds the position of Assistant Professor at Gulberg College for Women, Lahore. She is also a Visiting Professor at FCC Chartered University, Lahore, Pakistan. She has also done Master's in English Literature from University of Punjab, along with a Master's in Educational Planning and Management.

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