Nanotechnology: Sol-Gel Auto combustion

A study on Magnesium doped Lithium-Cobalt Nanoferrite for Microwave applications

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Abstract: Lithium–Cobalt ferrites are continuously drawing attention for their extensive applications in the field of Microwave transmission as isolators, circulators and even for EMI shielding [1-2]. A low-coercivity, high-remanence, soft magnetic nature coupled with square hysteresis loop, is required for microwave operation. However, improvement in the above properties is still required to use them safely over wide frequencies and temperature. It is well reported that, synthesis and sintering temperature govern the cation distribution, which in turn tailor the properties of the final material. The present work focused to study and understand the effect of non-magnetic Mg^{2+} substitution on structural and magnetic properties of Li-Co ferrite synthesized using sol-gel charring technique. Samples with five different mole fractions are prepared maintaining the charge balance and Stoichiometry. All the samples are characterized using XRD, SEM, VSM techniques. All the diffracted peaks in XRD (Fig.1) confirm the formation of single spinel phase. The calculated lattice constant shows a moderate decrease with increasing the dopant (Mg^{2+}) concentration. EDS and SEM (Fig.2) images shows the presence of all elements used in the preparation and confirmed various grains with Nano meter dimension. The FTIR (Fig.3) studies of sample confirmed the presence of spinel structure in the sample. VSM results showed (Fig.4) an overall decreasing trend of Magnetization with increase in dopant concentration, which is due to the substitution of Mg^{2+} ions. A significant influence of grain size and magnetic parameters are observed with Mg^{2+} substitution. The coercivity values are found to be lower, with adequate Remanence when compared with reported values, suggest these samples are useful for microwave applications [3].

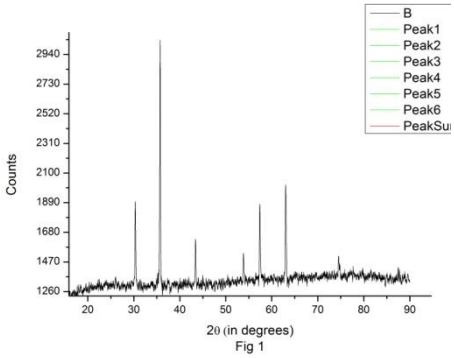
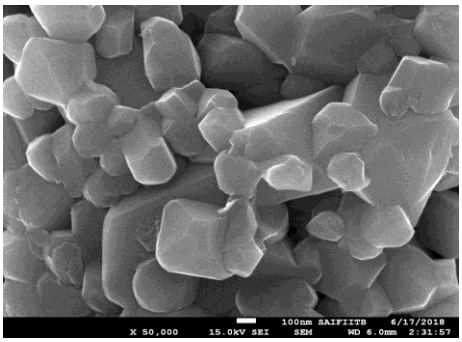
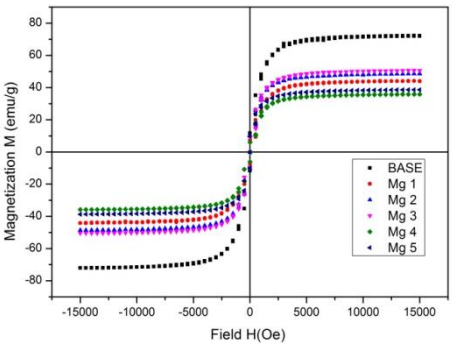


Fig 1





***Keywords**: Lithium Ferrite, Sol-Gel auto-combustion, Microwave applications, EMI shielding*

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