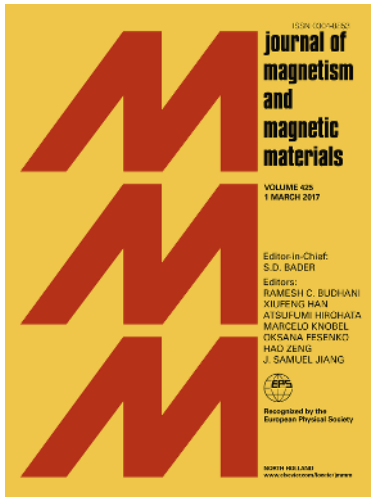

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Comparative study of the structural and magnetic properties of alpha and beta phases of lithium ferrite nanoparticles synthesized by solution combustion method

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ABSTRACT

The structural and magnetic properties of Lithium ferrite nanoparticles synthesized through the solution combustion route at different fuel to oxidizer ratio are studied using different techniques. Powder X-ray diffraction studies show that the fuel to oxidizer ratio is a critical parameter that determines the phase purity and degree of order of the samples. Magnetic studies show that the saturation magnetization and coercivity are comparable to those reported for lithium ferrites prepared using other methods. Saturation magnetization of Li0.8 sample at room temperature is 60 emu/g and is close to the bulk value. The hyperfine parameters obtained from the Mössbauer spectra of Li0.6 and Li0.8 also match the reported values of phase pure samples. Mössbauer spectra of samples prepared at stoichiometric and fuel rich conditions show the presence of Fe^{2+} cations in the ferrite phase, indicating that a reducing environment which reduces Fe^{3+} to Fe^{2+} ions is created as the fuel to oxidizer ratio is increased. The variation in the structural and magnetic properties of the samples, combined with TGA and FTIR studies, shows that the fuel lean condition is more appropriate for the direct formation of single phase lithium ferrite nanoparticles.

1. INTRODUCTION

Lithium ferrite has unique magnetic and electrical properties compared to other members of the spinel ferrite family[1–3]. The remarkable differences in properties make this material more interesting, both scientifically and technologically. Compared to other members in the spinel ferrite family, lithium ferrite has square hysteresis loop with high saturation magnetization and Curie temperature which creates the material suitable for the microwave device applications[2].