Table Captions

Table 1.1  Summary and comparison of synthetic methods

Table 4.1  Effect of HCl washes on structural parameters like lattice constant \( (a) \), crystallite size \( (D_x) \), R-Bragg factor \( (R_{Bragg}) \), and Goodness of fit \( (\chi^2) \) determined from Rietveld refinement for \( \text{Co}_{0.5}\text{Zn}_{0.5}\text{Fe}_2\text{O}_4 \) (CZ5B) system

Table 4.2  Refined parameters like crystallite size \( (D_x) \), lattice parameter \( (a) \), Cation distribution, and reliability factors are obtained from X-ray diffraction (XRD) and neutron diffraction (ND) analysis of NaCl treated and untreated sample CZ5B and CZ7A

Table 4.3  Sample Codes

Table 4.4  Structural parameters like cation distribution, crystallite size \( (D_x) \), lattice constant \( (a) \), density \( (\rho) \), reliability factors like \( R_p \), \( R_{wp} \) and Goodness of fit \( (\chi^2) \) determined from Rietveld analysis of CZ5A, CZ5B and CZ5C samples

Table 4.5  Structural parameters like cation distribution, crystallite size \( (D_x) \), lattice constant \( (a) \), density \( (\rho) \), reliability factors like \( R_p \), \( R_{wp} \) and Goodness of fit \( (\chi^2) \) determined from x-ray diffraction pattern analysis of CZ7A, CZ7B and CZ7C samples

Table 4.6  FTIR Results of studied samples

Table 4.7  FTIR Results of studied samples
Table 4.8  Structural and magnetic parameters like lattice constant \((a)\), oxygen parameter \((u)\), cation distribution, magnetic moments and agreement factor are determined from Neutron diffraction (ND) pattern analysis at \(T=300\text{K}\)

Table 4.9  Mean ionic radius of molecule, theoretically calculated oxygen parameter, interatomic distance and bond angle are calculated for systems \(X=0.5\) and \(0.7\) for different size particles

Table 4.10  Structural and magnetic parameters like lattice constant \((a)\), magnetic moments and agreement factor are determined from temperature dependent Neutron diffraction (ND) pattern analysis for CZ7A sample

Table 4.11  Structural and magnetic parameters like lattice constant \((a)\), magnetic moments and agreement factor are determined from field dependent Neutron diffraction (ND) pattern analysis for CZ7A sample at \(=10\text{K}\)

Table 4.12  Structural and magnetic parameters like lattice constant \((a)\), magnetic moments and agreement factors are determined from temperature dependent Neutron diffraction (ND) pattern analysis for CZ7B sample

Table 4.13  Structural and magnetic parameters like lattice constant \((a)\), magnetic moments and agreement factor are determined from field dependent Neutron diffraction (ND) pattern analysis for CZ7B sample at \(T=10\text{K}\)

Table 4.14  Structural and magnetic parameters like lattice constant \((a)\), magnetic moments and agreement factor are determined from temperature dependent Neutron diffraction (ND) pattern analysis for CZ7C sample

Table 4.15  Structural and magnetic parameters like lattice constant, magnetic moments and agreement factor are determined from field dependent Neutron diffraction (ND) pattern analysis for CZ7C sample at \(T=10\text{K}\)
Table 4.16  Magnetization measurement data like Magnetization @70 (kOe), M(emu.gm⁻¹), and Coercivity \( H_c \) (kOe), The Parameters derived from the Bloch theory fitting are Bloch constant (\( \beta \)) and saturation magnetization \( M(0) \) at 0K

Table 4.17  Derived parameter like saturation magnetization (\( M_s \)) and spontaneous magnetization (\( M_0 \)) at different temperature from magnetization measurement

Table 4.18  Observed and derived magnetization parameters like Magnetization \( M \) (emu.gm⁻¹)@70 (kOe), Coercivity \( H_c \) (kOe), Spontaneous magnetization \( M_0 \) (emu.gm⁻¹), saturation magnetization \( M_s \) (emu.gm⁻¹) and Paramagnetic susceptibility \( \chi_p \times 10^{-4} \) (emu.gm⁻¹.Oe⁻¹) at different temperature. The Parameters derived from the Bloch theory fitting like Bloch constant (\( \beta \)) and saturation magnetization \( M(0) \) at 0K

**Figure Captions**

Figure 1.1  Varieties of magnetic orderings (a), ferromagnetic, (b) antiferromagnetic and (c) ferrimagnetic

Figure 1.2  Inverse susceptibility varies with T for (a) paramagnetic, (b) ferromagnetic, (c) ferrimagnetic, (d) antiferromagnetic materials. \( T_N \) and \( T_C \) are Néel temperature and Curie temperature, respectively

Figure 1.3  Spin lattice orbit interactions

Figure 1.4  Schematic illustrating the processes of nucleation and subsequent growth