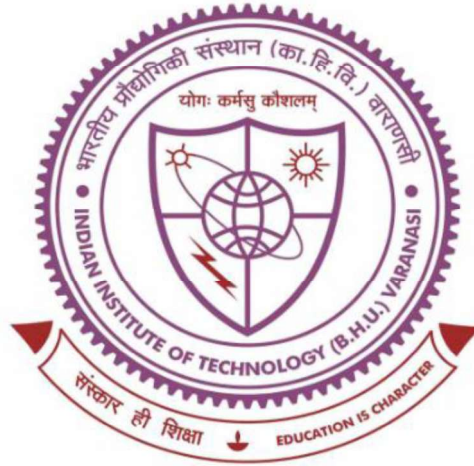


# Structure and Local Structure Driven Novel Magnetic Properties of Co-Mn Based Spinel Compound



THESIS SUBMITTED IN PARTIAL FULFILLMENT

FOR THE AWARD OF DEGREE

*Doctor of Philosophy*

By

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2024



*Dedicated to my Beloved  
Family*



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## *Abbreviations*

<i>A</i>	Tetrahedral site
<i>B</i>	Octahedral site
<i>ccp</i>	Cubic closed packed
<i>fcc</i>	Face-centered cubic
XAFS	X-ray absorption fine-structure
XRD	X-ray diffraction
10 Dq	Crystal field stabilization energy
OSPE	Octahedral site preference energy
eV	Electron volt
keV	Kilo electron volt
<i>J-T</i>	Jahn-Teller
<i>J</i>	Exchange integral
FM	Ferromagnetic
FIM	Ferrimagnetic
AFM	Antiferromagnetic
$T_C$	Curie temperature
$T_{C1}$	High temperature transition
$T_{C2}$	Low temperature transition
$T_{p1}$	Peak temperature corresponding to high temperature transition
$T_{p2}$	Peak temperature corresponding to low temperature transition
$M_A$	<i>A</i> sublattice magnetization
$M_B$	<i>B</i> sublattice magnetization
CIFC	Central instrument facility center
GMF	Geometrical magnetic frustration

$\chi^{-1}$	Inverse susceptibility
H	Magnetic field
K	Kelvin
$H_{\text{CEB}}$	Conventional exchange bias field
$H_{\text{SEB}}$	Spontaneous exchange bias field
VMS	Vertical Magnetization shift
M	Magnetization
$\mu_{\text{B}}$	Bohr magneton
<i>f.u.</i>	Formula unit
MT	Magnetization versus temperature
MH	Magnetization versus field
$M_{\text{s}}$	Saturation magnetization
$T_{\text{s}}$	Spiral ordering temperature
$\lambda$	Wavelength
$d$	Inter planer spacing
$\theta$	Bragg angle
Å	Angstrom
JCPDS	Joint committee on powder diffraction standards
$\mu$	X-ray absorption coefficient
XANES	X-ray Absorption Near Edge Structure
EXAFS	Extended X-ray Absorption Fine Structure
$N$	Coordination number
$E_0$	Absorption edge energy
$R$	Absorber-backscatterer distance
$\sigma^2$	Mean-square relative displacement

$S_0^2$	Amplitude reduction factor
VSM	Vibrating sample magnetometer
SQUID	Superconducting Quantum Interference Device
nm	Nanometer
mg	Milligram
Oe	Oersted
$H_C$	Coercivity
$T_l$	Lock-in transition temperature
FT	Fourier-Transformed
$N_{idp}$	Number of independent parameters
$N_p$	Number of fitted parameters $\varepsilon$
$\varepsilon$	Lattice strain
$D$	Crystallite size
ZFC	Zero-field cooling
FC	Field cooling
$T_{irr}$	Irreversible temperature
$\xi$	Correlation length
$M_{max}$	Maximum magnetization
$M_S$	Saturation magnetization
at. %	Atomic percentage
$P_T$	Tetragonal phase fraction
FWHM	Full width at half maxima

