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

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FOR THE AWARD OF DEGREE

Doctor of Philosophy

By

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Dedicated to my Beloved Family

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Abbreviations

A	Tetrahedral site
B	Octahedral site
ccp	Cubic closed packed
fcc	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
J-T	Jahn-Teller
J	Exchange integral
FM	Ferromagnetic
FIM	Ferrimagnetic
AFM	Antiferromagnetic
T_C	Curie temperature
Tc_1	High temperature transition
Tc_2	Low temperature transition
Tp_1	Peak temperature corresponding to high temperature transition
Tp_2	Peak temperature corresponding to low temperature transition
M_A	*A* sublattice magnetization
M_B	*B* sublattice magnetization
CIFC	Central instrument facility center
GMF	Geometrical magnetic frustration

χ^{-1}	Inverse susceptibility
H	Magnetic field
K	Kelvin
H_{CEB}	Conventional exchange bias field
H_{SEB}	Spontaneous exchange bias field
VMS	Vertical Magnetization shift
M	Magnetization
μ_B	Bohr magneton
f.u.	Formula unit
MT	Magnetization versus temperature
MH	Magnetization versus field
M_s	Saturation magnetization
T_S	Spiral ordering temperature
λ	Wavelength
d	Inter planer spacing
θ	Bragg angle
Å	Angstrom
JCPDS	Joint committee on powder diffraction standards
μ	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
σ^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 parametersε
ε	Lattice strain
D	Crystallite size
ZFC	Zero-field cooling
FC	Field cooling
T_{irr}	Irreversible temperature
ξ	Correlation length
M_{max}	Maximum magnetization
M_S	Saturation magnetization
at.%	Atomic percentage
P_T	Tetragonal phase fraction
FWHM	Full width at half maxima