Glossary of Symbols

Common symbols throughout all Chapters

T  Temperature
kB  Boltzmann constant
H  Magnetic Field
M  Magnetization
Tc  Curie temperature
Dx  Crystallite Size diameter
A  Tetrahedral site
B  Octahedral site
a  Lattice parameter
u  Oxygen parameter

Chapter 1

B_d  Magnetic induction or flux density
µ_0  Universal constant of permeability in a free space
µ  Permeability
χ  Magnetic susceptibility
N  Number of atoms per unit volume
Z  Number of electron
e  Charge of electrons
r  orbital radius
c  Speed of light
C  Curie constant
Θ  Weiss constant
T_N  Néel temperature
K_u  Magnetocrystalline anisotropy constant for Uniaxial symmetry
K_1, K_0, K_2  Anisotropy constants
K_c  Magnetocrystalline anisotropy constant for cubic symmetry
\( K_s \)  Shape anisotropy constant
\( M_S \)  Saturation magnetization
\( N_a, N_c \)  Demagnetization factors in different axis
\( K_{\text{eff}} \)  Effective anisotropy constant
\( K_{sc} \)  Surface anisotropy constant
\( K_v \)  Magnetocrystalline anisotropy constant

\textbf{Chapter 2}

\( Q_A \)  Charges on the A site
\( Q_B \)  Charges on the B site
\( Q_O \)  Charges on the anions
\( E \)  Energy
\( J \)  Exchange integral
\( x \)  Ion concentration
\( X_c \)  Percolation threshold
\( H_c \)  Coercivity
\( v_0 \)  Frequency factor
\( V \)  Particle volume
\( T_B \)  Blocking temperature
\( V_B \)  Blocking volume
\( L_q \)  Angular quantum number
\( \delta \)  Change in oxygen positional value
\( p_d, q_d \)  Center to Center distances between cation anion
\( b_d, c_d, r_d, s_d \)  Center to Center distances between the cations
\( d_d, e_d, f_d \)

\textbf{Chapter 3}

\( T_i \)  Initial temperature
\( T_f \)  final temperature
\( \lambda \)  wavelength
$d_{hkl}$    Interplanar distance
$\theta$    Angle
$F_{hkl}$    structure factor
$f^i(Q)$    Atomic scattering factor
$g^i$    Population factor
$t^i(Q)$    Temperature factor
$hkl$    Miller indices
$\rho(\varepsilon)$    Spatial density
$Q$    Momentum transfer
$Z_e$    Atomic number
$\beta$    Full width at half maxima
$k$    Force constant
$m$    Mass
$h$    Plank’s constant
$b$    Scattering length
$\sigma$    Incident neutron flux
$\Gamma$    Widths of the resonance
$\mathcal{J}$    Cross section for coherent scattering
$S$    Cross section for incoherent scattering
$k', k''$    Wave vectors
$w$    Debye-Waller factor
$S$    Spin quantum number
$\gamma$    Magnetic moment of neutron
$f$    Magnetic form factor
$G$    Magnetic scattering amplitude
$m_v$    Unit vector parallel to the magnetic moment
$m_e$    Mass of the electron
$\lambda_v$    Unit vector for polarization state
Chapter 4

\( R_{\text{Bragg}} \) Bragg factor
\( \chi^2 \) Goodness of fit
\( Z_m \) Number of molecules per formula unit per unit cell
\( M_w \) Molecular weight
\( N_A \) Avogadro’s number
\( R_p, R_{wp} \) Reliability factors
\( R_A, R_B \) Tetrahedral and octahedral site radius
\( k_t, k_o \) Force constants for tetrahedral and octahedral sites
\( M_{w1}, M_{w2} \) Molecular weight of cations on tetrahedral and octahedral sites
\( C_{11} \) Stiffness Constant
\( B \) Bulk modulus
\( \sigma_p \) Poisson’s ratio
\( k_{\text{avg}} \) Average force constant
\( V_1 \) Longitudinal elastic wave velocity
\( V_s \) Transverse elastic wave velocity
\( G_R \) Rigidity modulus
\( E_Y \) Young's modulus
\( V_m \) Mean elastic wave velocity
\( \theta_B \) Debye temperature
\( V_A \) Mean atomic volume
\( k \) Propagation vector
\( R_{\text{mag}} \) Magnetic agreement factor
\( r_A, r_B \) Radius per molecule of the tetrahedral and octahedral sites
\( R \) Bond lengths
\( u_{\text{theo}} \) Theoretically calculated oxygen parameter
\( M(\mu_B) \) Magnetic moment
\( M(T) \) Magnetization at a particular temperature
\( M(0) \) Magnetization at 0 K
\( \beta \) Bloch constant
\( \alpha \) Bloch exponent
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<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
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<tr>
<td>$\chi_p$</td>
<td>Paramagnetic susceptibility</td>
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<tr>
<td>$M_s$</td>
<td>saturation magnetization</td>
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<tr>
<td>$M_s(D)$</td>
<td>Saturation magnetization of $D_\gamma$-sized particle</td>
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<tr>
<td>$M_s(0)$</td>
<td>Saturation magnetization of bulk sample at 0 K</td>
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<tr>
<td>$t$</td>
<td>Thickness of magnetically dead layer</td>
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<tr>
<td>$M_0$</td>
<td>Spontaneous magnetization</td>
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<tr>
<td>$T_{irr}$</td>
<td>Thermo magnetic irreversible temperature</td>
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<tr>
<td>$T_B$</td>
<td>Blocking temperature</td>
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<tr>
<td>$T_{FBM}$</td>
<td>Mean spin freezing/blocking temperature</td>
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