

*Evolution of Dielectric Relaxation and  
High  $k$  dielectricity in Doped Oxides:  
Interplay of crystal structure and  
Electronic states in the lattice*



A thesis submitted in partial fulfillment for the  
Award of Degree

**DOCTOR OF PHILOSOPHY**

By

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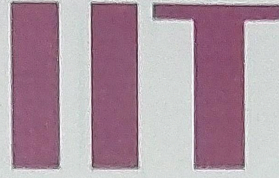
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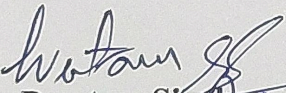


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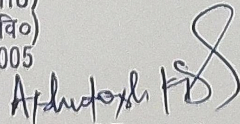
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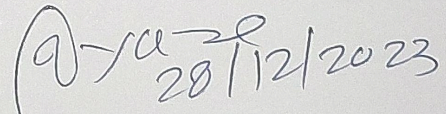
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## LIST OF ABBREVIATIONS

| Notation      | Abbreviations                                   |
|---------------|---|
| <i>et al.</i> | et alia, Latin for “and others “                |
| <i>i.e.</i>   | That is   |
| <i>e.g.</i>   | Example   |
| <i>etc.</i>   | Et cetera, Latin for “and other similar things” |
| UV            | Ultra-violet                                    |
| mg            | Milligram                                       |
| g             | Gram  |
| cm            | Centimeter                                      |
| Hz            | Hertz   |
| min           | Minute  |
| hr            | Hour  |
| $s^{-1}$      | Per Second                                      |
| <i>viz.</i>   | Namely  |
| IR            | Infrared  |
| XRD           | X-ray diffractometer                            |
| SEM           | Scanning electron microscopy                    |
| MPMS          | Magnetic property measurement system            |
| SEM           | Scanning electron microscopy                    |
| MHz           | Megahertz                                       |
| RT or rt      | Room temperature                                |
| EDX           | Energy dispersive X-ray spectroscopy            |
| ZFC           | Zero field cooled                               |
| FC            | Field cooled                                    |
| VSM           | Vibrating sample magnetometer                   |
| P-E           | Ferroelectric hysteresis loop                   |
| M-H           | Magnetic hysteresis loop                        |
| $M'$          | Real electrical modulus                         |
| $M''$         | Imaginary electrical modulus                    |
| XPS           | X-ray Photoelectron Spectroscopy                |
| $R_F^2$       | (Structure R factor) <sup>2</sup>               |
| E             | Applied Electric field                          |
| $D$           | Average crystalline size                        |
| $R_b$         | Bragg factor                                    |
| $H_c$         | Coercive field                                  |
| $T_c$         | Curie temperature                               |

|              |                                  |
|--------------|----------------------------------|
| FM           | Ferromagnetic                    |
| J            | Leakage current density          |
| PVA          | Polyvinyl Alcohol                |
| P            | Polarization vector              |
| T            | Temperature                      |
| $H$          | Magnetic field                   |
| M            | Magnetization                    |
| $M_s$        | Saturation magnetization         |
| $H_c$        | Coercivity                       |
| $M_r$        | Remanent magnetization           |
| $Y^{obs}$    | Observed profile                 |
| $Y^{cal}$    | Calculated profile               |
| $R_p$        | Profile residual factor          |
| $R_{wp}$     | Weight profile residual factor   |
| $R_{exp}$    | Expected profile residual factor |
| $R$          | Resistance                       |
| C            | Capacitance                      |
| $a, b, c$    | Lattice parameters               |
| J            | Current density                  |
| K            | Kelvin                           |
| $i, j, k, l$ | spatial coordinates              |
| k            | kilo                             |

| <b>Symbols used</b> |                         |
|---------------------|-------------------------|
| <b>Symbols</b>      | <b>Full name</b>        |
| °C                  | Degree Celsius          |
| $\sigma$            | Conductivity            |
| $\chi^2$            | Chi square              |
| $\delta$            | Delta                   |
| >                   | Greater than            |
| <                   | Less than               |
| $\lambda$           | Wavelength              |
| $\omega$            | Omega                   |
| $\chi$              | Magnetic susceptibility |
| $\epsilon$          | Dielectric permittivity |
| $\theta$            | Bragg's angle           |
| C                   | capacitance             |