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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DECLARATION BY THE CANDIDATE

I, ***Neeraj Singh***, certify that the work embodied in this thesis is my own bonafide work carried out by me under the supervision of ***Dr. Preetam Singh*** from ***July 2017*** to ***July 2023***, at the ***Department of Ceramic Engineering***, Indian Institute of Technology (BHU), Varanasi. The matter embodied in this thesis has not been submitted for the award of any other degree/diploma.

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It is certified that the above statement made by the student is correct to the best of my/our knowledge.

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Neeraj Singh.

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LIST OF ABBREVIATIONS

Notation	Abbreviations
et al.	et alia, Latin for "and others "
i.e.	That is
e.g.	Example
etc.	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
viz.	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) ^{2}
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

Symbols used	
Symbols	**Full name**
°C	Degree Celsius
σ	Conductivity
χ^2	Chi square
δ	Delta
>	Greater than
<	Less than
λ	Wavelength
ω	Omega
χ	Magnetic susceptiblity
ε	Dielectric permittivity
θ	Bragg's angle
C	capacitance