

## KOYAL SUMAN SAMANTARAY .

3<sup>rd</sup> Year Ph.D. Scholar,  
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### EXPERTISE:

#### Experimental Condensed Matter Physics:

- Synthesis of Chemically Modified Sodium Bismuth Titanate (NBT), Barium Titanate (BT), and Copper Oxide (CuO), Zinc Titanates (ZnTiO<sub>3</sub>, Zn<sub>2</sub>TiO<sub>4</sub>, etc.)
- Structure-Property Correlation
- Temperature-dependent Dielectric and Ferroelectric Properties and Raman Spectroscopy
- Room Temperature Multiferroic Properties
- Electrocaloric Effect
- Effect of variance of Ionic Size and Valence State on Optical and Electrical Properties
- **Characterization Techniques:** X-Ray Diffraction (XRD), Field Emission Scanning Electron Microscope (FESEM), Energy Dispersive X-ray Spectroscopy (EDX), X-Ray Photoluminescence Spectroscopy (XPS), Raman Spectroscopy, UV-Vis measurement, PE-loop tracer, Dielectric Measurement, AC Conductivity, Complex Impedance Spectroscopy
- **Synthesis Techniques:** Sol-gel, Hydrothermal, Microwave

### EDUCATION:

Academic Year	Course	CGPA/Percentage		Institute
2019-2020	Ph.D. Course work (Dept. of Physics)	CGPA-9.22		Indian Institute of Technology, Indore, India
2013-2018	5-Yr Integrated Msc. in Physics (Dept. of Physics and Astronomy)	Undergraduate (2013-2016)	Postgraduate (2017-2018)	National Institute of Technology, Rourkela, India
		CGPA: 8.44	CGPA-9.01	
2011-2013	Intermediate in Science	Percentage – 86.82		BJB Junior. College, Bhubaneswar, Odisha, India
2011	Matriculation	CGPA: 10		Jawahar Navodaya Vidyalaya, Mundali, Cuttack, Odisha, India

## PROJECTS:

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<b>COMPLETED PROJECTS:</b> <ul style="list-style-type: none"><li>• Investigating the Multiferroic Properties of NBT-CMO solid solutions.</li><li>• Effect of Mn doping on the Structural, Optical, and Vibrational properties of ZnTiO<sub>3</sub>.</li><li>• Theoretical and experimental insight on defect dipole induced improved electrocaloric response in Fe and Mn modified Na<sub>0.47</sub>Bi<sub>0.47</sub>Ba<sub>0.06</sub>Ti<sub>0.98-x</sub>V<sub>0.02</sub>O<sub>3</sub> lead-free ceramics.</li><li>• Structure Correlated Vibrational, Optical, and Electrical Properties of Fe doped Na<sub>0.47</sub>Bi<sub>0.47</sub>Ba<sub>0.06</sub>Ti<sub>0.98-x</sub>V<sub>0.02</sub>Fe<sub>x</sub>O<sub>3</sub>.</li></ul>	<b>ONGOING PROJECTS:</b> <ul style="list-style-type: none"><li>• Investigating the thin-film fabrication of NBT-based materials for better Electrocaloric response.</li><li>• Effect of M: Ba (M=Ca, Sr, and K) ratio in the Electrocaloric response of NBT-6BT ceramics.</li></ul> <b>FUTURE PROJECTS:</b> <ul style="list-style-type: none"><li>• To design polymer ceramic composite for Piezoelectric Energy harvester.</li></ul>
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## RESEARCH INTEREST:

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- Perovskites
- Ferroelectrics
- Dielectrics
- Impedance/Modulus spectroscopy
- Energy Storage
- Piezoelectric properties
- Electrocaloric effect
- Multiferroic properties
- Defect states study
- Piezoelectric energy harvester
- Device fabrication using Thin-film Technology

## EXPERIENCE:

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### June 2019- July 2021 (Ph.D.)

- Synthesis (Modified sol-gel) and Characterizations of NBT and BT based materials
- Structure correlated optical and electrical properties.
- Theoretical and Experimental insight on phonon modes and their correlation with structure.
- Defect states studies using valence state analysis of XPS spectra.
- Ferroelectric, dielectric, and electrocaloric properties of perovskites.

### July 2017-May 2018

#### (Master's Thesis at NIT Rourkela, India, 769008)

- Synthesis using a modified sol-gel process, and its Characterizations.
- Structural and Dielectric properties of Ca modified BaTiO<sub>3</sub>.
- AMPLIMODE analysis using "BILBAO CRYSTALLOGRAPHIC SERVER".

### May 2016-July 2016

#### (Summer Internship at IIT Bhubaneswar, India, 752050)

- Hydrothermal Synthesis and characterizations of  $\text{CuWO}_4$  and Graphene reduced  $\text{CuWO}_4$  nanostructures
- Electrode preparation and supercapacitor application using Cyclic voltammetry.

### May 2015-July 2015

#### (Summer Internship at CSIR-IMMT, Bhubaneswar, 751013)

- Hydrothermal and Microwave synthesis of  $\text{CuO}$  nanostructures
- Electrochemical measurements and their correlation with the morphology
- Application of the prepared materials as glucose sensors

### Instruments handling Expertise:

- XRD (Bruker D2 Phaser).
- RT, High Temp., and Frequency-dependent Dielectric measurements (Newton's 4<sup>th</sup> Ltd. Phase Sensitive Multimeter)
- Room Temp. PE Loop Tracer (Marine India)
- UV- Vis (Research India Spectrophotometer).
- Raman Spectrophotometer (HORIBA Scientific Lab-RAM HR Evolution Spectrometer).
- FESEM (Zeiss supra-55)
- EDS (Oxford Instruments, X-MaxN)
- Cyclic voltammetry (Kanopy), Inova
- Spin coating, CVD (two-zone furnace)

### RESEARCH MENTOR :

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Dr. Somaditya Sen	Department of Physics IIT Indore	Thesis supervisor (2019- 2023)
Dr. Dillip Kumar Pradhan	Department of Physics and Astronomy, NIT Rourkela	Master's Thesis Supervisor (2017-2018)
Dr. Chandra Sekhar Rout	School of Basic Sciences, IIT Bhubaneswar	Summer Internship Supervisor (2016)
Dr. Saroj Kumar Singh	Advanced Materials Technology, CSIR- IMMT	Summer Internship Supervisor (2015)

### SOFTWARE SKILLS:

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Origin (Graphs plotting and analysis), Zotero and EndNote (Adding References), FullProf Suite (Rietveld Refinement), VESTA (Structural Analysis), Fityk (Raman spectra analysis), ImageJ, Mercury (Structural Analysis), XPS PEAK4.1 (XPS spectra analysis), EC-Lab (Impedance spectra analysis)

## REFEREES:

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- ❖ **Dr. Somaditya Sen**, Associate Professor, Dept. Of Physics, IIT Indore, India; [sens@iiti.ac.in](mailto:sens@iiti.ac.in), +91-8839799363
- ❖ **Dr. Dillip Kumar Pradhan**, Associate Professor, Dept. Of Physics and Astronomy, NIT Rourkela, India; [dillippradhan@nitrkl.ac.in](mailto:dillippradhan@nitrkl.ac.in), +918328923740
- ❖ **Dr. Indranil Bhaumik**, Scientific Officer G, Head of Crystal Growth Laboratory, Associate Professor, Homi Bhabha National Institute, Crystal Growth & Instrumentation Section, Laser, and Functional Materials Division, RRCAT, Indore; [neel@rrcat.gov.in](mailto:neel@rrcat.gov.in), +919424512781

## PUBLICATIONS:

#	AUTHORS	TITLE of Publication	JOURNAL	Year
A1	Saniya Ayaz, Ruhul Amin, <b>Koyal Samantray</b> , Arup Dasgupta, Somaditya Sen	Tunable ultraviolet sensing performance of Al-modified ZnO nanoparticles	<a href="#">Journal of Alloys and Compounds 884 (2021) 161113</a>	2021
A2	Ruhul Amin, <b>Koyal suman Samantaray</b> , E.G. Rini, Indranil Bhaumik, Somaditya Sen	Grain and grain boundary contributions to AC conductivity in ferroelectric $Ba_{0.75}Pb_{0.25}Ti_{1-x}Zr_xO_3$ ceramics	<a href="#">Ceramics International 47 (2021) 13118–13128</a>	2021
A3	<b>Koyal Suman Samantaray</b> , Ruhul Amin, E.G. Rini, Somaditya Sen	Fe-doped $Na_{0.47}Bi_{0.47}Ba_{0.06}Ti_{0.98-x}V_{0.02}Fe_xO_3$ : Structure correlated vibrational, optical, and electrical properties	<a href="#">Journal of Alloys and Compounds 848 (2020) 156503</a>	2020
A4	Rakesh K. Sahoo, Arya Das, <b>Koyel Samantaray</b> , Saroj K. Singh, Rajaram S. Mane, Heon-Cheol Shin, Je Moon Yun and Kwang Ho Kim	Electrochemical glucose-sensing characteristics of two-dimensional faceted and non-faceted CuO nanoribbons	<a href="#">CrystEngComm, 2019, 21, 1607</a>	2019
A5	<b>Koyal Suman Samantaray</b> , Surjit Sahoo and Chandra Sekhar Rout	Hydrothermal Synthesis of CuWO <sub>4</sub> -Reduced Graphene Oxide Hybrids and Supercapacitor Application	<a href="#">American Journal of Engineering and Applied Sciences, 9(3), 584-590</a>	2016

## DRAFTS COMMUNICATED:

B1	Ruhul Amin, <b>Koyal Suman Samantaray</b> , Saniya Ayaz, Sachindra N. Sarangi, Indranil Bhaumik, Somaditya Sen	Room Temperature Multiferroicity with enhanced ferroelectric and ferromagnetic properties in $Ba_{0.75}Pb_{0.25}Ti_{1-x}Fe_xO_3$	(Under Review in Journal of Alloys and Compounds)	2021
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**DRAFTS WRITTEN and Ready to be communicated:**

#	AUTHORS	TITLE of Publication
J1	<b>Koyal Suman Samantaray</b> , Ruhul Amin, E. G Rini, Indranil Bhaumik, A. Mekki, Somaditya Sen	Defect dipole induced improved electrocaloric effect in Fe and Mn modified $\text{Na}_{0.47}\text{Bi}_{0.47}\text{Ba}_{0.06}\text{Ti}_{0.98-x}\text{V}_{0.02}\text{Fe}_x\text{O}_3$ Lead-free ceramics
J2	<b>Koyal Suman Samantaray</b> , Prashant Mishra, Mahesh Kumar, E.G Rini, Somaditya Sen	Effect of Mn doping on structural, optical, and vibrational properties of ilmenite type $\text{ZnTiO}_3$

**WORK DONE but not drafted:**

Title	Tentative date of the ready draft
Structure correlated multiferroicity in $(1-x)\text{Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3-x\text{CaMnO}_3$ solid solution	31 <sup>st</sup> July 2021
Effect of Ca: Ba ratio on structural, optical, vibrational, and electrical properties of NBT-6BT lead-free ceramics	20 <sup>th</sup> August 2021

**Workshops and Conferences:**

- ❖ **2021 (MAR):** Oral Presentation at International Conference on Current Trends in Material Science and Engineering (CTMSE)
- ❖ **2021 (FEB):** Poster Presentation at International Conference on Nanoscience and Nanotechnology (ICONN)
- ❖ **2020 (AUG):** Participated in International Webinar on Frontiers in Experimental Physics (IWFEP)
- ❖ **2019 (DEC):** Oral Presentation at 2<sup>nd</sup> International Conference on processing and characterization of materials (ICPCM) held at NIT-Rourkela
- ❖ **2017 (SEPT):** International School on Fundamental Crystallography and Workshop on Structural Phase Transitions: A Satellite School of 24th IUCr Congress, 2017 at National Institute of Technology, Rourkela.

**Languages:** English, Hindi, Oriya

**HOBBIES:**

- *Singing*
- *Playing Badminton*
- *Teaching*
- *Gardening*