

BIDISHA MUKHERJEE

Contact Information	National Center for High Pressure Studies (NCHPS) RC N001, IISER Kolkata, Mohanpur-741246 Nadia, West Bengal, India	b. mukherjee943@gmail.com bm19rs037@iiserkol.ac.in Mob: +91 7001485179 or, +91 8327001745
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Education	Doctor of Philosophy, Physical Sciences (Thesis submitted) Thesis title - Exploring Phase Transitions in Double Perovskite Oxides under Extreme Conditions of Pressure Indian Institute of Science Education and Research (IISER) Kolkata National Centre for High Pressure Studies Supervisor: Prof. Goutam Dev Mukherjee	2019-2025 Coursework CGPA: 9.5
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Master of Science, Physics The University of Burdwan	2016-2018 CGPA: 8.1 First Class
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Bachelor of Science, Physics Kalna College, The University of Burdwan, West Bengal	2013-2016 Score: 66.38% First Class
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Research Interest	My research interests lie in experimental condensed matter physics, specifically in the study of double perovskite oxides subjected to extreme conditions. My focus includes high-pressure experiments using diamond anvil cells, micro-Raman spectroscopy, synchrotron-based XRD measurements and low-temperature experiments.
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Research Experience	My research experience includes synthesis of novel polycrystalline materials using solid state synthesis method or sol-gel method and characterizing them using lab-XRD, SEM (Scanning Electron Microscopy), EDAX (Energy Dispersive), XPS (X-ray Photoelectron Spectroscopy) measurements. To measure the optical band gap of the sample, I have used UV-Vis absorption spectroscopy. I have performed high-pressure experiments using diamond anvil cells and low temperature Raman spectroscopic experiments using cryostat. Applying pressure or lowering temperature alters the atomic arrangements inside a unit cell of lattice which in turn can lead to a structural phase transition or some other structural modification to accommodate the large strain exerted on it. To understand how structural changes impact a material's elastic, electronic, and magnetic behavior, I utilize synchrotron X-ray diffraction (XRD) measurements at high pressure, micro-Raman spectroscopy at high pressure and low temperature, and first-principles Density Functional Theory (DFT) calculations at high pressure. I have worked using different types of diamond anvil cells: Diacell Bragg-(S) Plus Piston type diamond anvil cell (with culet diameter of 300 microns), piston type miniature nonmagnetic diamond anvil cell (with culet diameter of 600 microns), Diacell Symmetric DAC (with culet diameter of 300 microns). I am proficient in using various data analysis software such as Dioptas, Fit2D, PowderCell and GSAS.
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Ongoing works	To investigate the high-pressure behaviour of $\text{Ho}_2\text{CoMnO}_6$, a 3d-4f double perovskite oxide, I performed synchrotron XRD and micro-Raman spectroscopic measurements. At high pressure, we found distinct slope changes of Raman modes at 6 GPa and 16 GPa with the FWHM becoming minimum at 6 GPa followed by a slope change in FWHM around 16 GPa with pressure without any structural transition (from XRD data analysis). We suspect the presence of an electronic, spin state or magnetic transition at the above-mentioned pressure
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points. So, we are collaborating with ESRF, France, ID24 X-ray absorption beamline for high pressure XAS experiment to find any spin-state transition there. Presently I am learning the Athena software to perform the analysis of XAS data obtained.

Publications

1. **Soft mode induced structural phase transition in $\text{Ba}_2\text{ZnTeO}_6$ at high pressure;** **B. Mukherjee**, S. Adhikari, M. Sahu, A. K. Mishra, B. Giri, P. Johari, K. Glazyrin, and G. D. Mukherjee; arXiv:2503.11971 (under review).
2. **Pressure-induced electronic transformation of Co_2TiO_4 : A possible metallization;** M. Sahu, S. Chakraborty, **B. Mukherjee**, B. Ghosh, S. Raj, and G. D. Mukherjee; arXiv:2504.00574 (under review).
3. **Structural transition and emission enhancement in vacancy ordered halide double perovskite Cs_2TeCl_6 under pressure;** S. Mukherjee, D. Samanta, **B. Mukherjee**, K. Glazyrin, G. D. Mukherjee, Applied Physics Letters 126, 141901 (2025)
4. **Pressure-induced softening in bulk modulus due to magneto-elastic coupling in $\text{Nd}_2\text{CoFeO}_6$ double Perovskite;** **B. Mukherjee**, M. Sahu, D. Samanta, B. Ghosh, B. Joseph, and G. D. Mukherjee; Journal of Applied Physics 136 (9) (2024).
5. **Structural Metamorphosis and Band Dislocation of Trirutile NiTa_2O_6 under Compression;** S. Karmakar, **B. Mukherjee**, A. B. Garg, D. Ss Gavali, R. Thapa, S. Banerjee, G. D. Mukherjee, A. Haque, D. Behera; The Journal of Physical Chemistry C 126 (8), 4106-4117 (2022).
6. **Strain induced electronic transition in 1T' MoTe_2 : high pressure Raman, x-ray diffraction, resistivity measurements and first principles theoretical studies;** B. Ghosh, P. Saha, **B. Mukherjee**, D. Samanta, G. Shukla, G. D. Mukherjee; Electronic Structure 3 (4), 045002 (2021).
7. **Temperature dependence of phonon anharmonicity in Eu-doped BaTiO_3 ,** M. Sahu, **B. Mukherjee**, S. Purwar, A. K. Mishra, B. Ghosh, T. Setti, and G. D. Mukherjee, Manuscript ready to submit.

Skills

1. **Experimental:** Extensive experience in high-pressure experimental physics, including diamond anvil cell handling, Raman spectroscopy (high-pressure, low-temperature), synchrotron XRD. Proficient in materials synthesis (solid-state, sol-gel), sample characterization (XRD, SEM, EDAX, XPS).

Synchrotron Light Source Experience:

User of the [ELETTRA](#) synchrotron in Italy for high-pressure X-ray diffraction measurements.

Accepted proposals:

20240133	Response of Strain on Double Perovskite Oxides, $\text{Ba}_2\text{NiTeO}_6$ and $\text{Ho}_2\text{CoMnO}_6$
20230403	Pressure induced structural investigation of $\text{Ba}_2\text{ZnTeO}_6$

User of the PETRA III synchrotron in Germany for high-pressure X-ray diffraction measurements.

Accepted proposals:

I-20240342	Response of Strain on Double Perovskite Oxides, $\text{Ba}_2\text{NiTeO}_6$ and $\text{Ho}_2\text{CoMnO}_6$
I-20221137	Pressure driven structural investigation of $\text{Sm}_2\text{CoFeO}_6$

- 2. Softwares:** LaTeX, MS Office, ImageJ, Fit2D, Dioptas, Crysfire, Chekcell, PowderCell, GSAS, VESTA, LabSpec6, WinSpec, Quantum ESPRESSO, VASP (Structural optimization, electronic structure, phonon frequency calculations using DFT and DFPT)
- 3. Programming:** Origin, Python, Matlab, EosFit7-GUI.
- 4. Mentoring:** Mentored one graduate project.
- 5. Teaching Assistance:** PH4101 Condensed Matter Theory (2020),
PH3204 Electronics Laboratory (2021),
PH1202 Physics Laboratory I (2023)

Conferences and Workshops

1. National Conference: Materials at Extreme Conditions (MAX-2025), IGCAR, Kalpakkam, India. (**Talk**)
2. International conference: 61st European High Pressure Research Group (EHPRG) Meeting (2024), Thessaloniki Greece. (**Talk**)
3. Presented poster at DPS (Department of Physical Science) day (2024), IISER Kolkata.
4. Attended workshop on 'Correlated Quantum Matter' (2024), IISER Kolkata.
5. Attended Optical School 2021. (Virtual)
6. Attended webinar on Experimental & Computational Tools for Materials Research (ECTMR 2020)

Academic Achievements

1. International Travel Support from Science and Engineering Research Board (SERB), India.
2. Qualified CSIR UGC National Eligibility Test (NET) 2018, DEC with JRF AIR 111.
3. UGC Research Scholar.

4. Qualified GATE 2019 with AIR 1097

Referees

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