

# Nirmalendu Patra, Ph.D.

*Hard worker, quick learner, deep thinker*

SLAC National Accelerator Laboratory

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## WORK EXPERIENCE

### SLAC National Accelerator Laboratory, Stanford University, California — Postdoctoral Research Scholar

June 2020 - PRESENT

- Conducting in-situ/operando XAS experimental planning, data acquisition, data analysis on different types of catalyst materials.
- Demonstrating the data and results to the collaborating group members and preparing manuscripts for publications.
- Helping Co-ACCESS team effort to broaden the experimental capabilities.
- Teaching the students and collaborators about the XAS technique and data analysis.

## FUTURE RESEARCH INTEREST

1. In-situ / Operando XAS characterizations on catalys and battery materials. Material synthesis, structure, stability, morphology and activity studies on the heterogeneous catalysts.
2. Structure , morphology and magnetic characterizations on metallic alloys, oxides and thin films.

## EDUCATION

### 1. Homi Bhabha National Institute, Mumbai, India — Ph.D in Physics

Jan 2015 - Jan 2020

**Thesis title:** Investigation on local structures of various thin film Heusler alloys by XAS and XMCD measurements.

**Objective:** To study the local atomic structure, surface morphology and elemental composition of the PLD deposited Heusler alloy thin films and correlate their atomic structure with their magnetic properties.

### 2. Indian School of Mines, Dhanbad, India — M.Sc. in Applied Physics

2012 - 2014

CGPA- 8.73 out of 10

### 3. Vidyasagar University, Medinipur, India — B.Sc. Honours in Physics

2009 - 2012

Percentage- 73.75

## SKILLS

### Techniques

1. In-situ / operando XAS Study.
2. PCA and Clustering to visualize pattern in datasets
3. X-ray reflectivity studies
4. Thin film deposition using PLD
5. Sample preparation using solid state reaction method.
6. FESEM and EDS study.
7. Magnetic characterizations using VSM
8. X-ray Diffraction (elementary proficiency)
9. DFT for XANES spectra generation (elementary proficiency)

### Software knowledge

1. IFEFFIT software package i.e Athena, Artemis, Hephaestus for XAS data analysis
2. TXM-XANES Wizard for PCA and Clustering.
3. IMD for X-ray reflectivity data analysis
4. Origin 2021 for data plotting and analysis.
5. SPR-KKR for DFT study (elementary proficiency)

## AWARDS

DAE Group Achievement Award - 2015, Govt. of India

## PROFESSIONAL MEMBERSHIP

Materials Research Society of India (MRSI), Mumbai Chapter, India

**LANGUAGES:** English, Hindi, Bengali

## TRAVEL GRANTS

1. **Asia-Oceanic Forum for Synchrotron Radiation Research (AOFSRR)- 2018**, travel grant to attend the synchrotron radiation based workshop at Pohang Accelerator Laboratory, South Korea.
2. **Science and Engineering Research Board (SERB)**, Department of Science and Technology, Govt. of India travel grant to attend and present work in EUROMAT-2017 conference, Thessaloniki, Greece.

## CONFERENCES ATTENDED

1. International conference on X-ray absorption fine structure, XAFS2021 (Virtual), Sydney, Australia, 11 -13 July. (Abstract accepted for Oral presentation.)
2. 2nd International Conference on Recent Trends in Environment Sustainable Development (RTESD - 2019), Vivekananda Global University, Jaipur, Rajasthan, India - *Oral Presentation*.
3. Conference on Optics Photonics and Synchrotron Radiation (OPSR-2018), RRCAT, Indore, India- *Poster Presentation*
4. Material Research Society of India-Young Material Researchers' Meet (MRSI-YMRM-2017), BARC, Mumbai, India - *Poster Presentation*
5. Department of Atomic Energy, Solid State Physics Symposium (DAE SSPS-2015 - 2018), Mumbai, India-*Poster Presentation*

## ACHIEVEMENTS

1. **Graduate Aptitude Test in Engineering (GATE) -2016** (National level exam for M. Tech. or Ph.D. entrance, conducted by Indian Institute of Science, Bangalore, India)
2. **Orientation Course for Engineering and Science (OCES) - 2014** (National level exam for the recruitment of Scientific Officer and Ph.D. , conducted by Bhabha Atomic Research Centre, Department of Atomic energy, Govt. of India)

## OTHERS

### Stanford University Postdoc Teaching Certificate Courses attended

1. Structure Matters: 21 Strategies to Promote Student Engagement and Make Classrooms Fair and Inclusive, Jan 19 - 22, 2021
2. Postdoc Teaching Workshop, Jan 26 2021.
3. Integrating Active Learning into Existing Lecture Sessions in 1-, 5-, 10-, or 20-minutes, Mar 9 2021
4. Microteaching Symposium, April 6 2021

## REFERENCES

1. Dr. Simon R. Bare (Postdoc Supervisor)  
Distinguished Staff Scientist  
SLAC National Accelerator Laboratory, 2575 Sand Hill Rd, Menlo Park, California 94025  
Email: [srbare@slac.stanford.edu](mailto:srbare@slac.stanford.edu) , Tel: (+1) 650-926-2629
2. Dr. D. Bhattacharyya (Ph.D. supervisor)  
Head, Synchrotron Science & Multilayer Physics Section,  
Atomic & Molecular Physics Division, Bhabha Atomic Research Centre, Mumbai-400085, Maharashtra, India.  
E-mail: [dibyendubarc@gmail.com](mailto:dibyendubarc@gmail.com), Tel: (+91) 022- 2559- 3872

## List of Publications:

### 2021:

1. On the Cobalt Carbide Formation in a Co/TiO<sub>2</sub> Fischer–Tropsch Synthesis Catalyst as Studied by High-Pressure, Long-Term Operando X-ray Absorption and Diffraction. I.K. van Ravenhorst, A.S.Hoffman, C.Vogt, A. Boubnov, N.Patra, R. Oord, C. Akatay, F.Meier, S.R.Bare, B.M. Weckhuysen. *ACS Catalysis*, 11 (2021), 2956– 2967.
2. Understanding defect-mediated cubic to hexagonal topotactic phase evolution in SrMnO<sub>3</sub> thin films and associated magnetic and electronic properties. Arup Kumar Mandal, Anupam Jana, Binoy Krishna De, Nirmalendu Patra, Parasmani Rajput, V. Sathe, S. N. Jha, R. J. Choudhary, and D. M. Phase. *Phy. Rev. B*, 103 (2021), 195110.
3. Room Temperature Weakly Ferromagnetic Energy Band Opened Graphene Quantum Dot Coupled Solid Sheets - A Possible Carbon Based Dilute Magnetic Semiconductor. Ganapathi Bharathi, Devaraj Nataraj, Oleg Yu Khyzhun, Daniel T. Thangadurai, Kittusamy Senthilkumar, Murugaiyan Sowmiya, Ramasamy Kathiresan, Ponmalai Kolandaivel, Mukul Gupta, Deodatta Phase, Nirmalendu Patra, Shambhu Nath Jha, Dibyendu Bhattacharyya. *Applied Surface Science*, 548 (2021), 149195.
4. Unraveling the impact of nonmagnetic Sc substitution on the magnetic properties of La<sub>2</sub>NiMnO<sub>6</sub> double perovskite. Nasir, Mohammad and Khan, Mahmud and Bhatt, Subhash and Patra, Nirmalendu and Bhattacharyya, Dibyendu and Sen, Somaditya. *Physica Scripta*, 96 (2021), 45805 – 45815.
5. Structural properties and luminescence dynamics of CaZrO<sub>3</sub>: Eu<sup>3+</sup> phosphors. Kunti, Arup K and Patra, Nirmalendu and Harris, Richard A and Sharma, Shailendra K and Bhattacharyya, Dibyendu and Jha, Sambhu N and Swart, Hendrik C, *Inorganic Chemistry Frontiers*, 8 (2021), 821 – 836.
6. Defect persuades paramagnetic properties of nickel doped ZnS nanocrystals and identification of structural, optical, local atomic structure. Soumendra Ghorai; Dibyendu Bhattacharyya; Nirmalendu Patra; Shambhu Nath Jha; Anup K Ghosh, *Journal of Materials Science: Materials in Electronics* (2021) (accepted)

### 2020:

1. Ensuring origin of intrinsic magnetism from structural studies in Cu<sub>0.945</sub>Fe<sub>0.055-x</sub>MnxO. Nasir, Mohammad and Kumar, Sunil and Patra, N and Ahmed, Md A and Shukla, DK and Rini, EG and Bhattacharya, D and Jha, SN and Sen, Somaditya. *Ceramics International*, 46 (2020), 4191 – 4196.

### 2019:

1. Pulsed laser deposited Co<sub>2</sub>FeSi Heusler Alloy thin films: Effect of different thermal growth processes. Patra, N and Prajapat, CL and Babu, PD and Rai, S and Kumar, S and Jha, SN and Bhattacharyya, D, *Journal of Alloys and Compounds*, 804 (2019), 470–485.
2. Insights into local atomic structure of Fe alloyed ZnS nanocrystals: Correlation with structural, optical, magnetic and photocatalyst properties. Ghorai, Soumendra and Patra, Nirmalendu and Pal, Arkadeb and Bhattacharyya, Dibyendu and Jha, Shambhu Nath and Ray, Biswajit and Chatterjee, Sandip and Ghosh, Anup K. *Journal of Alloys and Compounds*, 805 (2019), 363–378.
3. Influence of cation order and valence states on magnetic ordering in La<sub>2</sub>Ni<sub>1-x</sub>Mn<sub>1+x</sub>O<sub>6</sub>, Nasir, Mohd and Khan, Mahmud and Bhatt, Subhash and Bera, Anup Kumar and Furquan, Mohammad and Kumar, Sunil and Yusuf, Sk Mohammad and Patra, Nirmalendu and Bhattacharya, Dibyendu and Jha, Shambhu Nath. *physica status solidi (b)*, 256 (2019), 1900019.
4. Influence of chromium concentration on the structural, electronic structure, optical and temperature dependent magnetic properties of ZnS nanocrystals. Ghorai, Soumendra and Patra, Nirmalendu and Bhattacharyya, Dibyendu and Jha, Shambhu Nath and Ray, Bishwajit and Chatterjee, Sandip and Ghosh, Anup K. *Journal of Materials Science: Materials in Electronics*, 30 (2019), 3073–3089.
5. The effect of high temperature annealing on the antisite defects in ferromagnetic La<sub>2</sub>NiMnO<sub>6</sub> double perovskite. Nasir, Mohd and Khan, Mahmud and Kumar, Sunil and Bhatt, Subhash and Patra, Nirmalendu and Bhattacharya,

Dibyendu and Jha, Shambhu Nath and Biring, Sajal and Sen, Somaditya. *Journal of Magnetism and Magnetic Materials*, 483 (2019), 114–123.

6. Local structure and spectroscopic properties of Eu<sup>3+</sup>-doped BaZrO<sub>3</sub>. Kunti, Arup K and Patra, Nirmalendu and Harris, Richard A and Sharma, Shailendra K and Bhattacharyya, Dibyendu and Jha, Sambhu N and Swart, Hendrik C. *Inorganic chemistry*, 58 (2019), 3073–3089.

7. First results from the XMCD facility at the Energy-Dispersive EXAFS beamline of the Indus-2 synchrotron source. Patra, N and Sachan, UGPS and SundarRajan, S and Malhotra, Sanjay and Harad, Vijay and Agarwal, Ankur and Dwivedi, Ashutosh and Jha, SN and Bhattacharyya, D. *Journal of synchrotron radiation*, 26 (2019), 445–449.

8. Role of antisite disorder, rare-earth size, and superexchange angle on band gap, curie temperature, and magnetization of R<sub>2</sub>NiMnO<sub>6</sub> double perovskites. Nasir, Mohd and Kumar, Sunil and Patra, Nirmalendu and Bhattacharyya, Dibyendu and Jha, Shambhu Nath and Basaula, Dharma R and Bhatt, Subhash and Khan, Mahmud and Liu, Shun-Wei and Biring, Sajal. *ACS Applied Electronic Materials*, 1 (2019), 141–153.

9. Oxygen and cerium defects mediated changes in structural, optical and photoluminescence properties of Ni substituted CeO<sub>2</sub>. Tiwari, Saurabh and Rathore, Gyanendra and Patra, N and Yadav, AK and Bhattacharyya, Dibyendu and Jha, SN and Tseng, CM and Liu, SW and Biring, Sajal and Sen, Somaditya. *Journal of Alloy and Compounds* 782 (2019), 689–698.

10. Effect of growth temperature on the structural and magnetic properties of the pulsed laser deposited Co<sub>2</sub>FeAl thin films. Patra, N and Prajapat, CL and Babu, PD and Rai, S and Kumar, S and Jha, SN and Bhattacharyya, D. *Journal of Alloys and Compounds*, 779 (2019), 648–659.

11. Role of oxygen vacancies in Co/Ni Substituted CeO<sub>2</sub>: A comparative study. Tiwari, Saurabh and Khatun, Nasima and Patra, N and Yadav, AK and Bhattacharyya, Dibyendu and Jha, SN and Tseng, CM and Liu, SW and Biring, Sajal and Sen, Somaditya. *Ceramics International*, 45 (2019), 3823–3832.

12. Structural investigations of pulsed laser deposited NiO epitaxial layers under different fluence values. Singh, SD and Patra, Nirmalendu and Singh, MN and Mukherjee, C and Jha, SN and Sinha, AK and Ganguli, Tapas. *Journal of Materials Science*, 54 (2019), 1992–2000.

## 2018:

1. Radiative transition probability enhancement of white light emitting Dy<sup>3+</sup> doped and K<sup>+</sup> co-doped BaWO<sub>4</sub> phosphors via charge compensation. Kunti, AK and Patra, N and Sharma, SK and Swart, HC. *Journal of Alloys and Compounds*, 735 (2018), 2410–2422.

2. Origin of Local Atomic Order and Disorder in Co<sub>2</sub>Fe<sub>1-x</sub>Cr<sub>x</sub>Si Heusler Alloys: Theory and Experiment. Rani, Deepika and Kangsabanik, Jiban and Suresh, KG and Patra, N and Bhattacharyya, D and Jha, SN and Alam, Aftab. *Physical Review Applied*, 10 (2018), 54022.

3. Unraveling doping induced anatase–rutile phase transition in TiO<sub>2</sub> using electron, X-ray and gamma-ray as spectroscopic probes. Banerjee, D and Gupta, Santosh K and Patra, N and Raja, Sk Wasim and Pathak, N and Bhattacharyya, D and Pujari, PK and Thakare, SV and Jha, SN. *Physical Chemistry Chemical Physics*, 20 (2018), 28699–28711.

4. Effect of ionic size compensation by Ag<sup>+</sup> incorporation in homogeneous Fe-substituted ZnO: studies on structural, mechanical, optical, and magnetic properties. Bajpai, Gaurav and Srivastava, Tulika and Patra, N and Moirangthem, Igamcha and Jha, SN and Bhattacharyya, D and Riyajuddin, Sk and Ghosh, Kaushik and Basaula, Dharma R and Khan, Mahmud and Sen, Somaditya. *RSC advances*, 8 (2018), 24355–24369.

5. Atomic Layer Deposition of Transparent and Conducting p-Type Cu (I) Incorporated ZnS Thin Films: Unravelling the Role of Compositional Heterogeneity on Optical and Carrier Transport Properties. Mahuli, Neha and Saha, Debabrata and Maurya, Sandep Kumar and Sinha, Soumyadeep and Patra, Nirmalendu and Kavaipatti, Balasubramaniam and Sarkar, Shaibal K. *The Journal of Physical Chemistry C*, 122 (2018), 16356–16367.

6. Correlation of structural ordering with magnetic properties of pulsed laser deposited Co<sub>2</sub>FeGa Heusler alloy thin films. Patra, N and Prajapat, CL and De, Rajnarayan and Rao, KD and Babu, PD and Sinha, AK and John, Siju and Barshilia, HC and Jha, SN and Bhattacharyya, D. *Journal of Alloys and Compounds*, 748 (2018), 653–670.

**2017:**

1. Role of compensating Li/Fe incorporation in Cu<sub>0.945</sub>Fe<sub>0.055-x</sub>Li<sub>x</sub>O: structural, vibrational and magnetic properties. Nasir, Mohd and Patra, N and Ahmed, Md A and Shukla, DK and Kumar, Sunil and Bhattacharya, D and Prajapat, CL and Phase, DM and Jha, SN and Biring, Sajal and others. *RSC Advances*, 7 (2017), 31970—31979.
2. Local atomic structure investigation of AlFeCuCrMgx (0.5, 1, 1.7) high entropy alloys: X-ray absorption spectroscopy study. Maulik, Ornov and Patra, N and Bhattacharyya, D and Jha, SN and Kumar, Vinod. *Solid State Communications*, 252 (2017), 73—77.
3. Structural and magnetic characterization of the Ni<sub>55</sub>Fe<sub>19</sub>Ga<sub>26</sub> shape memory alloy thin film. Patra, N and Biswas, A and Prajapat, CL and Ghosh, A and Sastry, PU and Tripathi, S and Babu, PD and Biswas, Arup and Jha, SN and Bhattacharyya, D. *Journal of Alloys and Compounds*, 723 (2017), 1098—1112.
4. Graphene Quantum Dot Solid Sheets: Strong blue-light-emitting & photocurrent-producing band-gap-opened nanostructures. Bharathi, Ganapathi and Nataraj, Devaraj and Premkumar, Sellan and Sowmiya, Murugaiyan and Senthilkumar, Kittusamy and Thangadurai, T Daniel and Khyzhun, Oleg Yu and Gupta, Mukul and Phase, Deodatta and Patra, Nirmalendu and others. *Scientific reports*, 7 (2017), 1—17.

**2016:**

1. X-ray structural studies on solubility of Fe substituted CuO. Nasir, Mohd and Patra, N and Shukla, DK and Bhattacharya, D and Kumar, Sunil and Phase, DM and Jha, SN and Biring, S and Shirage, Parasharam M and Sen, Somaditya. *RSC advances*, 6 (2016), 103571—103578.
2. Fixed-bed column studies for the removal of hazardous malachite green dye from aqueous solution using novel nano zerovalent iron algal biocomposite. M Jerold, Daisy Joseph, N Patra, V Sivasubramanian. *Nanotechnology for Environmental Engineering*, (2016) 1—8.
3. EXAFS measurements on Mn doped CaF<sub>2</sub> phosphor with different Mn concentrations. Patra, N and Bakshi, AK and Bhattacharyya, D. *AIP Conference Proceedings*, 1731 (2016), 60026.