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Professional Experience

- Assistant Professor (2018- present): Department of Chemistry, IIT Kharagpur, Kharagpur, India
- Senior Researcher (2017 – 2018): Condensed Matter and Interfaces group, Debye Institute for Nanomaterials Research, Department of Chemistry, Utrecht University, Netherlands
- Research Collaborator (2016 – 2017): School of Chemistry, University of Geneva, Switzerland
- Swiss National Science Foundation (Early and Advanced) Postdoctoral Research Fellow (2013 – 2016): Department of Chemistry, University of Washington, Seattle, USA

Education

- **Ph.D.** (2013)
Department of Physical Chemistry, University of Geneva, Switzerland
- **Master of Science (M.S.)** (2007)
Chemical Science Division, Indian Institute of Science, Bangalore, India
- **B.Sc. (Hons.)** in Chemistry (2004)
Ramakrishna Mission Vidyamandira, Belur Math, Howrah (Affiliated to University of Calcutta)

Academic Honors and Award

- Royal-Society International Exchange Award with Prof. Malcolm Halcrow, University of Leeds, UK, 2020, Royal Society London, UK.
- Early Career Research Award, Science and Engineering Research Board (SERB), Department of Science and Technology, India, 2019.
- Faculty Research Initiation Grant award, Institute Scheme for Innovative Research and Development, 2018.
- Swiss National Science Foundation Fellowship for Advanced postdoctoral research, 2015
- Swiss National Science Foundation Fellowship for Early postdoctoral research, 2013
- Selected as finalist (among one of the 45 finalists selected globally) for the Elsevier Reaxys International PhD prize in Chemistry, 2013
- Academic Society of Geneva Travel Grant Award, 2012
- Best Poster Award, Swiss Crystallographic Society Meeting, 2012
- Recipient of Indian Institute of Science Integrated Ph.D. Fellowship, 2004-2007
- Recipient of National Merit Certificate in High School: 2000
- Recipient of National Merit Certificate in Secondary School: 1998

Invited Talks

- Invited Speaker in Pacificchem 2020 (now shifted to 2021), Honolulu, Hawaii, USA in the session "Molecular Spintronics Based on Coordination Chemistry".
- Invited Speaker, Spin in Molecules-Theory and Applications, Solid State and Structural Chemistry Unit (SSCU), Indian Institute of Science, Bangalore, India, December 2019.
- Invited Speaker, Modern Trends in Molecular Magnetism (MTMM-2), Indian Institute of Science Education and Research (IISER) Bhopal, India, November 2019.
- Chemistry Colloquium Invited lecture, North Bengal University, India, August 2019
- Invited Speaker, DBT Star College Programme, St. Xavier's College, Kolkata, July 2019
- Invited Contributed Talk in Phase Transition and Dynamical Properties of Spin Transition

- Materials (PDSTM) Conference, University of Florida, Gainesville, USA, May 2019.
- Invited Participant, Indo-French School and Workshop on Molecular Magnetism, Solid State and Structural Chemistry Unit (SSCU), Indian Institute of Science, Bangalore, India, November 2018.
- Indo-Japan meeting and International Conference on Advancement of Science and Technology, Visva-Bharati University, Santiniketan, India, September 2018
- Department of Chemistry, Utrecht University, Netherlands, June 2017
- Department of Inorganic Chemistry, University of Bayreuth, Germany, June 2017
- Department of Chemistry, Florida State University, Tallahassee, USA, February 2016
- Reaxys International PhD prize conference, Grindelwald, Switzerland, September 2014
- Department of Chemistry, Indian Institute of Technology, Guwahati, India, August 2013
- Physical Chemistry division, Indian Association for the Cultivation of Science, Kolkata, India, August 2013

Mentoring Experience

Master Students

- Dirk Floris Zwarts (M.Sc., Utrecht University): December 2017 – April 2018
- Lisa Peterhans (M.Sc., University of Geneva): June 2012 – December 2012
- Arnaud Humair (M.Sc., University of Geneva): June – July 2012
- Léo Egger (M.Sc., University of Geneva): August – September 2012
- Christophe Walder (M.Sc., University of Geneva): June 2010 – December 2010
- Abhijit Adak (2 Yrs M.Sc. in Chemistry, IIT Kharagpur): from July 2019
- Jayesh Arya (5 Yrs integrated B.Sc.-M.Sc. in Chemistry, IIT Kharagpur): from July 2019
- Madhusudan Dutta (2 Yrs M.Sc. in Chemistry, IIT Kharagpur): from April 2020
- Anupama Kisku (5 Yrs integrated B.Sc.-M.Sc. in Chemistry, IIT Kharagpur): from April 2020

PhD Students

- Mousumi Dutta (pursuing PhD under my guidance, Department of Chemistry, IIT Kharagpur): Since July 2018
- Chinmoy Das (pursuing PhD under my guidance, Department of Chemistry, IIT Kharagpur): Since July 2018

New Course Design Activity

- Designed new interdisciplinary Subject (4 credits) on “Light-induced Phenomena in Materials” for Masters and PhD students from Six Departments of IIT Kharagpur, namely, Chemistry, Physics, Materials Science Center, Metallurgy and Materials Engineering, Nanoscience and Engineering and Energy Science and Engineering.
- Designed Topics on “Semiconductor Nanocrystals” under the subject “The electronic structure and the photophysical properties of transition metal compounds” for Masters and PhD Students, University of Geneva, Switzerland.

Teaching Experience

- Instructor: 1st year undergraduate Practical course on Inorganic Chemistry, Department of Chemistry, IIT Kharagpur, August 2018- to date.
- Instructor: “Light-induced Phenomena in Materials” (CY61039); July-November 2019.
- Instructor: 1st Masters and 4th year integrated Masters course on “Solid State Chemistry” (CY50033), January 2019- to date.
- Lecturer, graduate course on physics and chemistry of Semiconductor Nanocrystals, October 2016 – November 2016, University of Geneva, Switzerland.
- Guest Lecturer on EPR and Mössbauer Spectroscopy for postgraduates: RKMVC College, India, January 2013.
- Graduate Teaching Assistant for undergraduate Practical Courses, Department of Physical Chemistry, University of Geneva, Switzerland: September to December (2009 – 2012)

Funded Projects

- Royal-Society International exchange research grant, UK; Project Title: Elucidating Fundamental Mechanisms in Switchable Molecular Materials; Duration: 2020-2022
- Early Career Research Award, Science and Engineering Research Board, Department of Science and Technology, India. Project title: Synthesis, Design and Stimuli-responsive Functionalities in Switchable Inorganic Materials: From Bulk to Single Molecule; Duration: 2019-2022
- Faculty Research Initiation Grant, IIT Kharagpur; Project Title: Enforcing multifunctionality in Inorganic Coordination Networks – effect of composition, size reduction and external stimuli; Duration: 2018-2021
- Swiss National Science Foundation Advanced Postdoc Fellowship; Duration: 2015-2016
- Swiss National Science Foundation Early Postdoc Fellowship, Duration: 2013- 2015

International Conference Organization

- Convener: One day Symposium on “Recent Advances in Molecular Magnetism”, 26th November 2019, Department of Chemistry, IIT Kharagpur.

Other Professional Activities

- Prof. in-charge for Chemistry Department Time Table, Autumn 2019-2020
- One of the Organizers: Chemistry Department Alumni Meet 2019
- Prof. in-charge for Departmental Scientific Seminars.
- DSC member for PhD students in the Department of Chemistry and Physics
- Member of the “Reaxys Prize Club Guidance Team”-Elsevier Reaxys: 2014 and 2015
- Member of the Swiss Chemical Society: 2009-2013
- Reviewer: Applied Physics Letters, Inorganic Chemistry

Professional Memberships

- Since 2016: Member of “UW Alumni”, University of Washington, Seattle, USA
- 2013-2016: Member of “UWPA”, University of Washington Postdoctoral Association, Seattle, USA Since 2013: Member of “Alumni UNIGE”, University of Geneva, Switzerland
- 2009-2013: Member of the Swiss Chemical Society
- Since 2007: Member of “Alumni IISc”, Indian Institute of Science, Bangalore, India
- Since 2004: Lifetime Member of “Alumni RKM Vidyamandira”, Belur Math, West Bengal, India

Research Interests

- Photophysics of switchable functional inorganic materials and structure-property correlation
- Semiconductor nanocrystals: doping, surface modification, electronic and optical properties
- Lanthanide nanomaterials: optical excitation, luminescence, excitation energy migration and transfer, energy transfer up- and down-conversion, persistent luminescence, and LEDs

List of Publications (since inception)

- (21) Anne-Laure Pelé, Teresa Delgado*, and **Pradip Chakraborty***, Thermal and photo-induced spin switching behavior in $Zn_{1-x}Fe_x(6\text{-mepy})_3\text{tren}(\text{PF}_6)_2$, $x \sim 0.5\%$, *to be submitted*.
- (20) Teresa Delgado, Mouhamadou Sy, Cristian Enachescu, Nahid Amstutz, Andreas Hauser, Kamel Boukheddaden, and **Pradip Chakraborty***, “Stimuli-responsive spin relaxation behavior in the low-spin stabilized $[\text{Ru}_{1-x}\text{Fe}_x(\text{ptz})_6](\text{BF}_4)_2$, $x \sim 0.5$, *submitted* (***Corresponding author**).
- (19) S. Maitra, **Pradip Chakraborty**, R. Mitra, T. K. Nath, “MgCoO₂ based suitable electrode material for aqueous Lithium ion, Sodium ion and Magnesium ion based Supercapacitor applications”, *under review*.
- (18) M. Meneses-Sanchez, L. Pineiro-Lopez, T. Delgado, C. Bartual-Murgui, M. C. Munoz, **Pradip Chakraborty**, J. A. Real, Extrinsic vs. intrinsic luminescence and their interplay with spin crossover in 3D Hofmann-type coordination polymers, *J. Mater. Chem. C*, **2020**, 8, 1623-1633.

- (17) **Pradip Chakraborty**, Yu Jin, Charles J. Barrows, Scott T. Dunham, and Daniel R. Gamelin, "Kinetics of Isovalent (Cd) and Aliovalent (In) Cation Exchange in $\text{Cd}_{1-x}\text{Mn}_x\text{Se}$ Nanocrystals", *J. Am. Chem. Soc.* **2016**, *138*, 12885 - 12893.
- (16) Charles J. Barrows, **Pradip Chakraborty**, Lindsey M. Kornowske, and Daniel R. Gamelin "Tuning Equilibrium Compositions in Colloidal $\text{Cd}_{1-x}\text{Mn}_x\text{Se}$ Nanocrystals Using Diffusion Doping and Cation Exchange." *ACS Nano* **2016**, *10*, 910 - 918.
- (15) Laurentiu Stoleriu, Alexandru Stancu, **Pradip Chakraborty**, Andreas Hauser, and Cristian Enachescu, "Analysis of first order reversal curves in the thermal hysteresis of spin-crossover nanoparticles within the mechanoelastic Model", *J. Appl. Phys.* **2015**, *117*, 17B307.
- (14) **Pradip Chakraborty**, Cristian Enachescu, Arnaud Humair, Léo Egger, Teresa Delgado, Antoine Tissot, Laure Guénée, Céline Besnard, Robert Bronisz, and Andreas Hauser, "Light induced spin-state switching in the mixed crystal series of the 2D coordination network $\{[\text{Zn}_{1-x}\text{Fe}_x(\text{bbtr})_3](\text{BF}_4)_2\}_\infty$: optical spectroscopy and cooperative effects", *Dalton Trans.* **2014**, *43*, 17786 - 17796.
- (13) Andrea Marino[#], **Pradip Chakraborty**[#], Marina Servol, Maciej Lorenc, Eric Collet, and Andreas Hauser, "The role of ligand-field states in the ultrafast photophysical cycle of the prototypical iron(II) spin-crossover compound $[\text{Fe}(\text{ptz})_6](\text{BF}_4)_2$ ", *Angew. Chem. Int. Ed.* **2014**, *53*, 3863 - 3867. ([#]Equal contribution)
- (12) **Pradip Chakraborty**, Antoine Tissot, Lisa Peterhans, Laure Guénée, Céline Besnard, Phil Pattison and Andreas Hauser, "Determination of the molecular structure of the short-lived light-induced high-spin state in the spin-crossover compound $[\text{Fe}(\text{6-mepy})_3\text{tren}](\text{PF}_6)_2$ ", *Phys. Rev. B* **2013**, *87*, 214306.
- (11) **Pradip Chakraborty**, Marie-Laure Boillot, Antoine Tissot, and Andreas Hauser, "Photoinduced relaxation dynamics in Fe(II) spin-crossover nanoparticles: the significance of crystallinity", *Angew. Chem. Int. Ed.* **2013**, *52*, 7139 - 7142.
- (10) **Pradip Chakraborty**, Sebastian Pillet, El-Eulmi Benedeif, Cristian Enachescu, Robert Bronisz, and Andreas Hauser, "Light induced bistability in 2D coordination network $\{[\text{Fe}(\text{bbtr})_3](\text{BF}_4)_2\}_\infty$: wavelength-selective addressing of molecular spin states", *Chem. Eur. J.* **2013**, *19*, 11418 - 11428.
- (9) **Pradip Chakraborty**, Cristian Enachescu, and Andreas Hauser, "Analysis of the experimental data for pure and diluted $[\text{Fe}_x\text{Zn}_{1-x}(\text{bbtr})_3](\text{ClO}_4)_2$ spin crossover solids in the framework of a mechanoelastic model", *Eur. J. Inorg. Chem.* **2013**, 770 - 780.
- (8) Hoa Phan, **Pradip Chakraborty**, Meimei Chen, Yitzi M. Calm, Kirill Kovnir, Lawrence K. Keniley, Jr., Jordan Hoyt, Elisabeth S. Knowles, Céline Besnard, Mark W. Meisel, Andreas Hauser, Catalina Achim, and Michael Shatruk, "Heteroleptic Fe(II) complexes of 2,2'-Biimidazole and its alkylated derivatives: spin-Crossover and photomagnetic Behavior", *Chem. Eur. J.* **2012**, *18*, 15805 - 15815.
- (7) **Pradip Chakraborty**, Cristian Enachescu, Christophe Walder, Robert Bronisz and Andreas Hauser, "Spin switching dynamics in the 2D coordination network $[\text{Zn}_{1-x}\text{Fe}_x(\text{bbtr})_3](\text{ClO}_4)_2$: the role of cooperative effects", *Inorg. Chem.* **2012**, *51*, 9714 - 9722.
- (6) **Pradip Chakraborty**, Robert Bronisz, Céline Besnard, Laure Guénée, Phil Pattison and Andreas Hauser, "Persistent bidirectional optical switching in the 2D high-spin polymer $\{[\text{Fe}(\text{bbtr})_3](\text{BF}_4)_2\}_\infty$ ", *J. Am. Chem. Soc.* **2012**, *134*, 4049 - 4052.
- (5) Laurentiu Stoleriu, **Pradip Chakraborty**, Andreas Hauser, Alexandru Stancu and Cristian Enachescu "Thermal hysteresis in spin-crossover compounds studied within the mechanoelastic model and its potential application to nanoparticles", *Phys. Rev. B* **2011**, *84*, 134102.

- (4) Itana Krivokapic, **Pradip Chakraborty**, Cristian Enachescu, Robert Bronisz and Andreas Hauser, “Low-Spin→High-Spin relaxation dynamics in the highly diluted spin- crossover system $[\text{Fe}_x\text{Zn}_{1-x}(\text{bbtr})_3](\text{ClO}_4)_2$ ”, *Inorg. Chem.* **2011**, 50, 1856-1861.
- (3) **Pradip Chakraborty***, Palash Roy Choudhury, and S. B. Krupanidhi, “Structural and dielectric behavior of pulsed laser ablated $\text{Sr}_{0.6}\text{Ca}_{0.4}\text{TiO}_3$ thin film and asymmetric multilayer of SrTiO_3 and CaTiO_3 ”, *J. Cryst. Growth* **2011**, 337, 7-12. (*Corresponding author)
- (2) Itana Krivokapic, **Pradip Chakraborty**, Robert Bronisz, Cristian Enachescu and Andreas Hauser, “Significant variation of the singlet–quintet intersystem crossing rate constant in an Iron(II) high-spin complex as a function of temperature”, *Angew. Chem. Int. Ed.* **2010**, 49, 8509-8512.
- (1) **Pradip Chakraborty*** and S. B. Krupanidhi, “Polarization enhancement in compositionally graded vanadium doped bismuth titanate thin films”, *J. Appl. Phys.* **2010**, 107, 124105. (*Corresponding author)

Total Citation: 475; **h-index:** 12; **i10-index:** 15 (Google Scholar Citation report)

Research Statement

Our research primarily targets the development and physical properties of the transition metal based inorganic molecular materials with switchable electronic structures that give rise to suitable photophysical, photochemical, chemical, electronic, magnetic and magneto-optical properties and their structure-property correlation. Incorporating functionality in inorganic molecular materials is an important focus of research and is capable of exhibiting diverse physical responses when subjected to various external conditions and has become very topical with regard to technological applications, for instance in displays, memories, switches, spintronics, magneto-optics, thermometry, storage and sensors (such as photonic sensors, which require thermo/piezo/vapo/solvato- chromic properties).

Our research aim to develop and exploit this exciting frontier of functional molecular materials in different forms of structure and dimensions. The following research directions would be undertaken in the group: (a) Probing the molecular and nanoscale spin state switching, (b) Switchable functional networks, (c) Hybrid switchable materials involving magnetic, conducting and/or luminescent functionalities, (d) Luminescent Materials involving lanthanides for persistent phosphor, LEDs and solar energy conversion applications. Our research heavily involves synthesis, design and physical characterizations of inorganic molecular materials. We are particularly focused on synthesizing new molecule-based switchable inorganic compounds in various forms in combination with structural and spectroscopic measurements to investigate the physical property (or functionality) of particular interest. However, the synthesis itself often requires novelty and essentially leads to new insights of fundamentally interesting and technologically useful properties. We use a wide variety of spectroscopic, structural and microstructural techniques to explore the physical properties of the switchable molecular materials. Our techniques include temperature dependent static and time-resolved optical absorption and luminescence, temperature dependent magnetic response and photo-magnetism, single-crystal and powder X-ray diffraction and photo- crystallography, Transmission Electron Microscopy in combination with Energy-dispersive X-ray, Scanning Tunneling Microscopy, Spin-coating, drop-casting and dip-coating (or constructive lithography) and photoconductivity. These studies are further integrated with theoretical modeling and electronic structure analysis to understand the mechanistic insights of the switching phenomenon. In addition, EPR, Mössbauer spectroscopy and temperature dependent Raman Spectroscopy are used. The combination of novel synthesis and state-of-the-art spectroscopies offers the powerful opportunity to discover, develop, and ultimately harness the physical properties of functional molecular materials.