Rahyan Bellabiod

Master's Student in Inorganic, Physical, and Solid-State Chemistry

Contact

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Research Interests

Astrochemistry and astrophysics, with a focus on material evolution in extreme environments & Observational Astrochemistry. Interested in using my interdisciplinary background to investigate the formation of key compounds in astronomical settings and the underlying mechanisms of their nanoscale assembly. My focus is on understanding the chemical processes occurring in extreme environments, such as star-forming regions in the outer reaches of galaxies.

Technical Skills

- **Spectroscopy:** FT-IR spectroscopy, UV-Vis spectroscopy, Raman spectroscopy. (and NMR)
- **Microscopy:** Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM).
- **Crystallography:** X-ray diffraction (XRD) and data analysis, experience in handling and characterizing crystal structures.
- **Laser Techniques:** Femtosecond laser irradiation and applications.
- **Programming:** Python3 for data analysis.
- **Other:** Fast learning, critical thinking, rigorous work, adaptability and efficiency under pressure, and strong team work ethic.

Professional Experience

Current Research Internship - ISMO (UP-Saclay) CNRS, France
April 2025 - Present supervised by Emmanuel Dartois

- **Project:** Laboratory Study of Interstellar Matter Analogs.
- **Key Achievements:**
  - Investigating the production and evolution of interstellar matter, Polycyclic aromatic hydrocarbon (PAHs), using plasma-based techniques.
  - Conducting UV and IR characterization of synthesized materials
  - Performing data analysis using Python3 programming

Bachelor's Internship - Institute of Low Temperature Science (Sapporo, Japan)
May 2024 - August 2024 (3 months) supervised by Prof. Yuki Kimura

- **Project:** Investigated material evolution in the universe from a microscopic point of view, specifically studying nanoscale nucleation and growth of Ca oxide and Si oxide.
- **Key Achievements:**
  - Characterized samples using FT-IR spectroscopy, TEM, and SEM
  - Contributed to understanding the mechanisms of material formation under astronomical conditions
  - Co-authored conference presentation: "In-situ IR Measurements of the Nucleation Processes of SiC Aiming to Elucidate the Mechanisms of Cosmic Dust Formation", The 53rd Japanese Conference on Crystal Growth (JCCG-53), Tokyo, November 2024

Bachelor's Internship - Nara Institute of Science and Technology (Nara, Japan)
May 2023 - July 2023 (2 months) supervised by Prof. Yoichiro Hosokawa and Dr. Yuka Tsuri

- **Project:** Studied the crystallization of dye molecules using femtosecond laser irradiation.
- **Key Achievements:**
  - Developed expertise in handling laser equipment
  - Analyzed crystal structures using X-ray diffraction
  - Results contributed to a joint UP-Saclay/NAIST PhD project
  - Work to be presented at LAMP2025 Congress in Japan: "Rhodamine B crystallization induced by Femtosecond-laser" (co-author)
  - Article soon published

Future Projects

Planned Internship - Niigata University, Japan
September 2025 - January 2026 (5 months) supervised by Takashi Shimonishi

- **Project:** To analyze JWST and ALMA data to explore the astrochemistry of star-forming objects in exotic environments.
- **Description:**
  - Will utilize spectroscopic data from the James Webb Space Telescope (JWST) and the Atacama Large Millimeter/submillimeter Array (ALMA) to investigate the composition of molecular clouds and protoplanetary disks in unique locations such as the Magellanic Clouds and the outer reaches of the Milky Way.
  - Will focus on identifying the presence of key organic molecules and dust precursors, providing insights into the chemical processes that lead to the formation of planetary systems in these unusual environments.
  - Will develop expertise in using advanced data reduction an analysis tools for astronomical observations.

Planned Internship - National Tsing Hua University, Taiwan
February 2026 - July 2026 (5 months) supervised by Daniel Harsono

- **Project:** Analysis of ALMA data toward young stellar objects and radiative transfer modeling.

- **Description:**
  - Will analyze ALMA data toward young stellar objects
  - Will perform radiative transfer modeling of sub-mm and IR (ALMA + JWST) observations
  - Will work on (Radiative-)Hydrodynamical simulations of young disks

Educational Background

Master's Degree in Inorganic, Physical, and Solid-State Chemistry
2024 - (In Progress)
Universite Paris-Saclay, Orsay (France)
Double Degree Bachelor in Chemistry and Life Sciences
2021 - 2024
Universite Paris-Saclay, Orsay (France)
Relevant Coursework in Chemistry: Quantum Chemistry, Chemical kinetics, Thermodynamics, Organic and Inorganic Chemistry, Spectroscopy, PhotoElectro chemistry, and Biochemistry.
The Double Degree program at Paris-Saclay University is a selective program offering full training in two different fields.

Languages

- French (Native)
- English (C1)
- Japanese (Beginner)
- Russian (Basic)