Saurabh Kumar Singh

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Surface Dynamics Lab, Swansea University, Wales, United Kingdom

Research Profile

My current research focuses on exploring alignment- and orientation-controlled reactive scattering processes in gas-surface chemical reactions on metal surfaces, with particular emphasis on the H_2 helicopter and cartwheel motion. I have developed expertise in quantum state-resolved surface scattering studies and high-resolution molecular laser spectroscopy.

Education

Postdoctoral Research Assistant Oct 2024 – Present
Surface Dynamics Lab, Swansea University, Wales, UK
Supervisor: Dr. Helen Chadwick

Ph.D. in Chemical Science 2018 – 2024
Tata Institute of Fundamental Research (TIFR), Hyderabad, India
Supervisor: Dr. Pranav R. Shirhatti
Thesis: *Understanding the Dissociation Dynamics of CO_2 on Cu(110) and Developing Techniques for State-Selected Molecule-Surface Scattering Experiments*

M.Sc. in Physical Chemistry 2016 – 2018
Banaras Hindu University, Varanasi, India
CGPA: 8.58/10

B.Sc. (Hons.) in Chemistry 2012 – 2015
Banaras Hindu University, Varanasi, India
CGPA: 7.7/10

Research Experience

Postdoctoral Research Assistant, Swansea University
Surface Dynamics Lab
Project: Rotationally controlled H_2 dissociation on single-crystal metal surfaces.

- Magnetic manipulation techniques to control the preparation of specific rotational nuclear spin quantum states in a molecular beam.
- Investigating alignment and orientation-dependent reactivity in gas-surface interactions.

Ph.D. Researcher, TIFR Hyderabad
Thesis: Dissociation dynamics of CO_2 on Cu(110); development of experimental techniques.

- Performed molecular beam scattering experiments to study molecule-surface reactions.
- Developed novel methods for quantum state-selected scattering experiments.
- Constructed UHV-compatible laser diagnostic setups for surface reaction studies.

Technical Skills

- **Experimental Techniques:** Molecular beam scattering, surface science (UHV systems), helium atom scattering, velocity map imaging (VMI), photoacoustic spectroscopy.
- **Instrumentation Development:** Laser frequency stabilization, ion/spatial imaging, non-linear laser optics, high-finesse optical cavity design, high-precision laser spectroscopy.
- **Software and Simulation:** MATLAB, LabVIEW, Python, SIMION (ion trajectory simulations), MolFlow+ (vacuum system simulations).
- **Analytical Techniques:** Laser spectroscopy (single- and multi-photon excitation), vacuum technology, mass spectrometry.

Fellowships and Awards

- Nominated for the Schmidt Science Fellows 2025 through TIFR Hyderabad (2024)
- Selected participant at the Global Young Scientists Summit (GYSS), 17–20 January 2023, Singapore.
- Junior Research Fellowship (CSIR-JRF), Government of India (2017)

Conferences / Workshops

- Poster on *"Dissociation Dynamics of CO on Cu(110) Surface"* at iCOMET-2023, November 12–17, 2023.
- Poster on *"Dissociation Dynamics of CO on Cu(110) Surface"* at SSDS-2023, October 5–8, 2023.
- Poster on *"Design and Development of Diagnostic Tools for Quantum State-Specific Studies"* at SDMC-2022, November 10–13, 2022.
- Poster on *"Design and Development of Diagnostic Tools for Quantum State-Specific Studies"* at TIFR Hyderabad In-house Symposium, September 15–17, 2022.
- Poster on *"Design and Development of Low-Cost Wavemeter"* at TACC 2020, March 03–05, 2021.

References

- **Prof. Gil Alexandrowicz**
  Professor, Chemistry, Swansea University, Wales, United Kingdom
  Email: g.n.alexandrowicz@swansea.ac.uk
- **Dr. Helen Chadwick**
  Senior Lecturer, Chemistry, Swansea University, Wales, United Kingdom
  Email: h.j.chadwick@swansea.ac.uk