

Statement of Purpose

Growing up, I saw my parents work for affordable drinking water in our town in rural Maharashtra (Central India). I was always acutely aware of the grim situation of drinking water in and around my home but never saw it affect us directly. Until one day, it did. The water crisis came knocking at our door, and we could not do anything. We watched as effluent water from one rice mill turned a beautiful lake into a toxic puddle and luscious farms into wastelands. Benjamin Franklin once said that we would see the true worth of water only when the well is dry. There was a war at our doorsteps, and we were not prepared. The lack of technological know-how thwarted all our attempts to treat the effluent water from the mill.

As time passed, I realized that the matter was not just about one mill, one type of effluent, or the lack of knowledge but about the lack of a sustainable and affordable infrastructure for wastewater treatment as a whole. The need to address this issue was my initial driving force towards the world of functional materials. Long before I came to know the term “functional materials,” I was inclined to develop a material for this purpose. I completed my graduation as a DST-Inspire fellow (Department of Science & Technology-Innovation of Science Pursuit for Inspire Research). Simultaneously I worked on ceramic-based water filtration techniques with my father manufacturing the Terafil ceramic candles. [Terafil](#) is a technology developed by [CSIR-IMMT India](#) to address the pure drinking water problem of rural India. However, I was unsure about the direction I needed to pursue research. When my parents encouraged me to appear for the IIT-JAM 2019 (Indian Institute of Technology-Joint Admission test for Masters) examination, I got a direction. I cleared it with an all-India rank of 318. Owing to my respectable rank, I was called for an interview in IISER Bhopal, among other places.

I cleared the two-round interview in IISER-Bhopal, the first step in my research journey. I took many introductory chemistry courses that exposed me to my strengths and weaknesses. Following which I took advanced level courses like Physical Properties of Matter, Applications of Modern Physical Methods, Quantum Mechanics and Spectroscopy, and Chemistry and Physics of Materials. I also took an interdepartmental elective course, “Introduction to detective Fiction,” to fuel my hobby and imagination. However, my actual exposure to the workings of a lab happened during my one-month lab rotation in Dr. Vishal Rai’s lab in December 2019. The rotation taught me essential organic synthesis, purification techniques, analysis techniques, and operating fundamental lab machinery. My subsequent exposure was with a completely different aspect of chemistry through a reading project under Dr. Rati Sharma in the Computational and Experimental Biophysics lab.

Eventually, in my second year, I joined as an MS student in the Functional Materials Laboratory, IISER Bhopal, which reignited my interest in functional materials for wastewater remediation. This interest solidified into a future career path when my MS supervisor Dr. Abhijit Patra gave me an opportunity to work for the DST-IITM Water-IC for SUTRAM of EASY WATER project under my PhD mentor Mr. Arkaprabha Giri. Working in this project taught me various synthetic and analytic techniques surrounding porous organic polymers, including FTIR, NMR, BET, HRMS, UV-Vis spectroscopy, Fluorescence spectroscopy, etc. I worked extensively on hyper-crosslinked polymers using the Friedel-Crafts reaction, solvent-knitting technique, and post-synthetic modification of the so formed polymers. The project involved an extensive literature survey and a comprehensive study of the field. I explored a wide range of techniques like thin-film formation, polymer-bead fabrication, etc., for micropollutant removal from water. Currently, my work involves the development of novel polymeric materials for dichromate oxoanion uptake from water. The central focus of this work is to fabricate a cationic material that can carry out dichromate uptake by anion exchange. The experience with this work motivated me to look for project-outcome-oriented PhDs so that my research could reach its final destination: the people in need.

Apart from the lab work, I became interested in scientific writing, which was actively encouraged in our lab. The experiences helped me immensely in scientific communication while composing literature survey reports and presentations, which were a regular feature during my MS. Along with writing and composing reports, this activity also helped me hone my skills with graphic designing software like Photoshop and Illustrator. I believe I will be an asset to the project. Another reason for my keen interest in this project is the unique exposure to scientific and industrial aspects of research, which I have sought very acutely.

Taking this into account, pursuing graduate studies as part of the IITKGP-University of Manchester Dual Doctoral Degree Program would undoubtedly give me a priceless opportunity to explore projects at the interface of scientific and industrial research. I earnestly believe that my ideas can constructively contribute to the scientific progress and advancement of the project's objectives. Finally, I sincerely hope that the IITKGP-University of Manchester Dual Doctoral Degree Program would provide an ideal atmosphere to fuel my growth as a researcher well-equipped to contribute to a sustainable and environmentally equitable world.