

Statement of Purpose

I am writing to express my interest to accomplish doctoral (PhD) degree in the project titled “Synthesis of graphene and graphene-based composites using agriculture waste for desalination” in the IITKGP-University of Manchester joint program as it has been my age long ambition to gain achievements in the field of research and encouraging others for the same. Thanks to the swift progress of my Bachelors and Master’s degrees, it is glaring that studying and doing research are endeavors I would like to engage in even more. While studying for my B.Tech in Chemical Engineering at Haldia Institute of Technology in India, I developed a strong interest in sustainable development and energy which is the need of the hour in the current scenario of environmental degradation and resulting global warming. I am currently in the final semester of my Master’s degree (M.Tech) in Fuel Engineering at Indian Institute of Technology (Indian School of Mines) Dhanbad in India, which will be completed by May 2021.

During my B.Tech, I worked on wastewater treatment by adsorption by means of Ca-Al Layered Double Hydroxide (fluoride removal) and Rice Husk (chromium removal) as adsorbent at IIT Kharagpur (under Dr. Sirshendu De) and as a part of final year project respectively. This had given me a fair idea of removal of different ions and salts as a part of wastewater treatment. In M.Tech, I wrote a review paper titled “Environmentally Benign and Sustainable Production of Hydrogen From Lignocellulosic Biomass Derived Compounds via Photo-reforming” where several photocatalysts and the effect of their properties on renewable hydrogen production was explored. In order to tackle the environmental degradation and march towards a sustainable economy, green alternatives to fossil fuels becoming increasingly important day by day. Instead of conventional fossil fuel, imposing the carbon-neutral conversion of lignocellulosic biomass (LCBM) can greatly contribute to the same. This project enabled me to understand the benefits of renewable resources.

Finally, in my M.Tech project I studied about “Synthesis of Carbon Nanomaterials using Agricultural Waste-based Biochar” which included graphene, carbon nanotubes, carbon nanospheres etc. which are of great use such as sensors, wastewater treatment, agriculture, energy storage, drug delivery etc. I wrote a review article titled “A Review on Various Carbon-based Nanomaterials using Lignocellulosic Biomass-based Biochar: Synthesis, Characterization, Applications and Potential Route” where apart from the review section, I also pitched an idea on “A Novel Synthesis of High-Value Carbon Nano Tubes via

conversion of Lignocellulosic Biomass" which was further shortlisted (44 teams out of 350 applications) for New Generation Ideation Contest-2020 by Hindustan Petroleum Green R&D Centre, Bengaluru. The idea involved utilization of biochar-based electrodes in arc discharge method to prepare carbon nanomaterials. Biochar in pristine and activated form have been utilized as a electrode material in applications such as supercapacitors, fuel cells, electrocatalysis etc. However no significant literature has reported so far the utilization of biochar-based electrodes in arc discharge method to produce carbon nanomaterials to the best of my knowledge. In arc discharge, the anode works as a carbon source and cathode acts as substrate for the nanomaterial to grow upon. Hence it is very important for the electrode material to have high carbon% and surface area which can be achieved by the biochar route. These properties of biochar can be further increased by physicochemical activation. This potential domain of application of activated biochar not only can replace the conventional graphite electrodes but also can play a significant role in "waste to valuable product conversion" approach in development of the sustainable and green economy.

My work routine during my postgraduation gradually turned into fondness for further studies in the aforementioned sector. Furthermore, due to recent lockdown in the last year, the institute laboratories were inapproachable, still I was indulged in 6 projects during that timeline which certainly my commitment and persistency. Therefore, I am confident that this PhD will bring me a step closer to my goal of becoming a scientist.

I believe that, being very diligent and highly motivated student, I am certain to push through the dedication I have always worked with to accomplish my goals and gain more knowledge. Lastly, being a hard-core foodie I always believe that cooking of food strongly resembles with scientific R&D. Hence my inclination towards research comes with a passion with which I am certain to excel. Thank you for considering my application.