

Statement of Purpose

You have to test out every possibility if you want something new.

John B. Goodenough

The beauty of research lies in the joy of exploring into unchartered areas and finding something new and unforeseen. But it is important to have the patience and meticulousness to keep looking for these flashes of opportunities in every possible way.

I opted for *Metallurgical and Materials Engineering* as my major for my undergraduate studies at the *Indian Institute of Technology, Kharagpur*. It wasn't until my 2nd year that I slowly understood what materials science and metallurgy meant in its core. Materials engineering, in general, fascinated me when I got introduced to it in my second-year course subjects. I was intrigued to know how little tweaks in certain aspects of a given material can completely change its properties and behaviors. Thus, giving rise to a vast amount of possibilities and opportunities to research. To get laboratory exposure in my second year, I tried gaining first-hand experience in various synthesis and characterization techniques, before taking up a project in my department. My first project was focused on using electrodeposition to produce nanostructured nickel that would eventually lead to better surface-related properties, and enhance its applicability. The channeled morphology and chemical analysis of the deposits provided exciting results. Having parallel curriculum courses on characterization techniques esp., 'Materials Characterization' and 'XRD & TEM', helped out a lot in the analysis. I got a decent understanding of the various electrochemical studies like CV, EIS, LSV, etc. during my research work.

Courses on 'Composite materials' and 'Advanced materials and processes', by Prof. Tapas Laha helped me gain more insights into different materials types, their applications, and synthesis routes. Techniques in these courses will go a long way to help me in my research work.

I undertook courses on energy materials, and physics of materials to gain a good understanding of solid state physics and applications. I decided to write a review on pseudocapacitive anode materials used for energy based applications. I got a chance to gain a lot of theoretical insights into the

possible strategies and tactics that can be useful in making more efficient battery materials. The concepts would be helpful in other fields as well.

The Dual Doctoral Program is a very new program and I am excited to be a part of it. Being already familiar with Prof. Indranil Manna through the course “Advanced phase Transformations” and Prof. Siddhartha Roy, through the course “Non-destructive Testing”. I feel confident to have a very productive 4 years of research work under their guidance.

Pursuing my degree at the Department of Materials, University of Manchester, will enable me to pursue a rewarding career combining experimental and theoretical techniques. I will be a part of a team at the forefront of design/application of surface engineering and tribology. I am interested to learn more about surface Engineering, in particular, under the guidance of Prof. Indranil Manna and Prof. Allan Matthews. I am very interested to know more about Prof. Philip Withers on X-ray computed tomography and its use to inspect Additive Manufactured(AM) material structural integrity as an effective characterization method. Access to a wide range of comprehensive lab capabilities, and experience under the expertise of my supervisors makes the program very lucrative for me.

If admitted to the JDP program, I shall be able to hone on my tenacious attitude and diverse undergraduate research to come up with a valuable contribution in the field. Getting a chance to exhibit my skills and excel at graduate studies through my research endeavors would surely go a long way in helping me achieve my future goals as a research scientist and setting positive examples back home.