STATEMENT OF PURPOSE

I, Sri. Debargha Paul, am writing this statement of purpose to portray my interest in pursuing further research in the topic "Microstructural effects on environmentally assisted cracking in model 7xxx alloys" through the Joint Doctoral Program organized jointly by The Indian Institute of Technology (IIT) Kharagpur and The University of Manchester.

The unique properties of aluminium alloys- be their high corrosion resistance, or high strength to weight ratio, have always made wonders around us, especially, in the aerospace industry. Going back to high school days, my chemistry teacher had introduced me to the topics related to metals and metallurgy. I gradually understood the vast field of materials science. This desire of learning more about alloys and metals urged me to enroll to the Metallurgy and Materials Engineering discipline as a major for my undergraduate degree.

During under graduation, I fell in love with subjects like Physical Metallurgy and Phase Transformation and Degradation of Materials. Therefore, I tried to learn the concepts of microstructural analysis, phase diagrams, corrosion etc. I applied for a winter internship at CSIR-NML where I got the opportunity to work on "Study of Magnetic Properties of Low Carbon Steel". The experience had enriched my knowledge and helped me in shaping my future goals.

The final year project for my undergraduate degree titled **"**Synthesis and Characterization of Ni-Mn-Sn Heusler Alloy by Mechanical Alloying**"** acted as a strong platform in sharpening my knowledge in the technical field. Phase identification of the samples was carried out using XRD and SLPA was adopted for determining the grain size and lattice strain of the most prominent peaks of Ni and Mn. I was able to confirm the inverse magnetocaloric effect of the sample from the Magnetic Entropy Vs. Temperature plot which showed a positive change of entropy. This journey had built the foundation in me to carry out research activities.

I qualified the Graduate Aptitude Test for Engineering (in MT) and took admission for the course M. Tech. in Metallurgical and Materials Engineering Department with specialization in Materials Engineering at IIT Roorkee. I carried out my final year M.Tech thesis work on "To establish the relation of grain boundary cementite in high carbon steel with process parameters" at Tata Steel Ltd. as a Tata Steel funded graduate research assistant under the supervision of Dr. S. K. Nath, Professor, IIT Roorkee and Mr. P. S. Mandley & Mr. R. S. Pathania from Tata Steel Ltd.. The change in cementite network in billet and wire rods with

varying process parameters was studied. Macro and micro-structural analyses of billets as well as characterization techniques of the wire rods were done. Dilatometric experiments were carried out to determine the change of cooling rate in steel structure which were analyzed by optical and SEM techniques. This work had taught me to be responsible for the effectiveness of one's result and to gain the ability in questioning the findings, which are of great importance for a successful independent research.

After post-graduation in 2020, I started working as a Manufacturing Engineer at Tata Sikorsky Aerospace Ltd. which is one of India's leading aerospace firms. This job has introduced me to the manufacturing domain. My primary responsibilities include contributing to materials and processes selection of detail parts. This job providing me good knowledge about the aero-structure and aero-engine components along with development of soft skills and leadership characteristics.

My main goal in life has always been to learn new things and to contribute in Science. I believe that conducting further research in this topic will help me greatly in achieving my goal. I strongly believe that the theoretical knowledge and research experience I gained during my bachelor and masters studies as well as the practical knowledge and skills I grew during my work in the industry are going to help me tremendously during my doctoral study in this Joint Doctoral Program at two prestigious universities. I am intrigued by the different aspects of physical metallurgy and characterization techniques which have always been the common factor throughout my academic career.

My dream of conducting advanced-level research and bringing notable excellence in the already thriving Aerospace Industry can be bridged only by an industry-relevant research topic such as yours. The state-of-the-art facilities and strong collaborative network fostered at the universities will assist me in enhancing my scientific and research capabilities. I eagerly await a fruitful research opportunity with IIT Kharagpur and The University of Manchester through the Joint Doctoral Program.