**Letter of Motivation**

Dear Dr. Alice Allen,

I am writing to enthusiastically express my keen interest in the postdoctoral research position in Machine Learning for Molecular Mechanics at the Max Planck Institute for Polymer Research. I recently completed my Ph.D. in Materials Engineering at Iran University of Science and Technology in 2022, where my research focused on the mechanism of formation and entrapment of oxide films in cast parts.

Throughout my academic career, I have developed a strong background in materials science, particularly in the areas of microstructural analysis, thermo-physical and mechanical characterization, and process design. My dissertation, titled “On the mechanism of the short-time oxidation at the surface of Al-Mg alloys with the addition of Beryllium and Calcium”, investigated the short-time oxidation of Aluminum-Magnesium melts in turbulent situations to understand the nature of bifilm (double-layer oxide) defects. Through microstructural and morphological studies, I observed significant reductions in oxide film thickness with the addition of Be and Ca. Additionally, I utilized advanced techniques such as HRTEM, XRD, and XPS for chemical and structural analysis of the samples. The main result of my thesis was the mechanisms suggested to explain the composition and formation sequence of thin oxide layers on the surface of the metal from the point that the molten metal is being poured into the mold cavity to the last stages of solidification. During my Ph.D., I also devised a method to physically simulate the process of bifilm formation in cast parts.

In addition to my academic achievements, I have a rich background in thermodynamics and am fluent in thermodynamic calculations using Factsage software. During my sabbatical period at the Korea Institute of Industrial Technology (KITECH), I worked with the Advanced Materials group, which focused on alloy design, specifically aluminum (Al) and magnesium (Mg) alloys. I have characterized samples using various techniques, including XRD, XPS, SEM, and HRTEM equipment. Moreover, I have supervised three MSc students during my Ph.D., which has further honed my ability to guide and mentor emerging researchers.

Although my primary research has focused on materials science, I have cultivated a strong interest in machine learning and its applications in molecular mechanics. I have been actively exploring machine learning techniques and their potential to revolutionize the field of molecular modeling. I am particularly excited about the opportunity to develop new architectures for machine learning models of molecular interactions and to create interatomic potentials for simulations of reactive chemistry and biological applications.

I am confident that my strong background, extensive skills, and enthusiasm make me an ideal candidate for this postdoctoral position. My hands-on experience with advanced microstructural, thermo-physical, and mechanical characterization, combined with my growing proficiency in machine learning and molecular mechanics, aligns perfectly with the goals of your research group. Furthermore, my proven ability to conduct systematic research, disseminate knowledge through publications in reputable journals, and efficiently supervise students enhances my suitability for this role.

I am incredibly enthusiastic about the possibility of discussing how my experience and interests align with the goals of your group and how I can contribute to the exciting work being done at the Max Planck Institute for Polymer Research. Thank you for considering my application.

Sincerely, Mehdi Akbarifar