

Statement of Purpose

1. Introduction

I have completed an M. Sc and an M. Phil in Physics from two renowned universities in Bangladesh. In 2005, I started teaching and continuing as an educator. Professionally I acquired some research and teaching experiences but need to advance myself to face the academic field's new challenges. Through proper research and innovative technology, we can solve many problems in our society. My desired research area is not available in my country; therefore, I desperately want to partake in a higher study from a neighbour country with enough facilities to continue study smoothly. In this perspective, a higher education degree from an advanced institution like the Indian Institute of Technology Kharagpur (IITKGP) will benefit me in gathering valuable research experiences. Besides, the Indian Council for Cultural Relations (ICCR) Scholarship program will assist financially as I do not earn enough as an assistant professor at a public college in Bangladesh to support family and study simultaneously.

2. Participation in research projects

During my M. Phil study at the Department of Physics in Bangladesh University of Engineering and Technology (BUET), I have compiled an informative thesis titled "Study of Structural and Electrical properties of Cu-Zn Ferrite with Alkali Chloride Substitutions." I prepared $Cu_xZn_{1-x}Fe_2O_4$ ferrite (where x varies from 0 to 1 mole% in steps of 0.2) doped with 0.05 and 0.1 wt. % $MgCl_2$ by reliable state reaction method. X-ray diffraction analysis of the sample indicates the formation of ferrite. Infrared transmission spectra show the presence of chlorine band, octahedral and tetrahedral group complexes. Scanning Electron Micrographs (SEMs) reveal granulation, intergranular porosity, and the presence of open pores, which play an essential role in determining the humidity sensitivity. Because of the researchers' interest in this work, it has been published as -

Bagum, N., Gafur, M. A., Bhuiyan, A. H., & Saha, D. K. (2010). $MgCl_2$ doped $Cu_xZn_{1-x}Fe_2O_4$ ferrite humidity sensors. *physica status solidi (a)*, 207(4), 986-992.

DOI: 10.1002/pssa.200925257

3. Areas of research interest

Recently, I am thinking of doing research in one of these areas—

- A. Experimental Condensed Matter Physics
- B. Biophysics
- C. Physics Education

4. Proposed plan

A. Experimental Condensed Matter Physics

My current research interest is to work on growth of magnetic materials compound like Ferrites and study both electrical and magnetic properties of the samples. I would like to research on different ferrite compound which can be used as sensors.

Research Interests: Semiconductor nanostructures; Magnetic Semiconductors and Superconductors; Electronic & magnetic materials; Sensors.

B. Biophysics

Another research interest is on the physics of biological systems. I choose this topic because I would like to apply the principles and methods of physics to understand biological systems. In addition, I will study biophysical processes at the cellular and tissue scales using theoretical and computational techniques.

Research Interests: Collective phenomena in biological active matter; Pattern formation during morphogenesis; Active and passive transport inside cell.

C. Physics Education

Current advancements in technology and society demand for renewal of practices in education to equip students for new emerging themes and competencies through student-centred practices. More recently research attention has been focused on the provision of a sufficient, discipline-specific basis of conceptual knowledge and on the productive use of information technology. I am interested in finding a suitable methods of teaching physics in colleges of Bangladesh.

5. Vision Statement

A. Reasons for wishing to pursue PhD Studies in India

India, being one of the leading countries rich in academic fields possesses a well-established and standard education system which can provide me the opportunity to acquire more knowledge concerning advanced research methods in science and technology and learning the prerequisites for development in relevant sector. The scholarship funded by the ICCR supports the students with enough facilities in carrying out their higher studies without any difficulties. The Department of Physics in IITKGP is affluent with study and research facilities which can enrich a student with quality education. Above all, to study in a more resourceful academic environment than that of my country, I have decided to apply for this scholarship.

B. Long-term career plan, aims and interests for future development after graduation

With IITKGP, I will get the chance to acquire research-based knowledge in my teaching field and learn to do excellent research. Besides, a higher education degree will help me get a promotion professionally and secure a prestigious position. In my workplace, I will apply my learned skills, contribute to scientific research, guide, and motivate students in research, and support other relevant activities. I will work hard to reach the cherished goal and try my best to give the nation excellent service. In getting a chance, I would like to apply my research for the betterment of ordinary people. In the future, I will continue research in my home country, spread knowledge to my future students, guide colleagues, and carry on my endeavors as an educator successfully. I want to become an active physicist and researcher to support Bangladesh by providing scientific solutions to national issues.

Overall, the ICCR Scholarship program provides the best opportunity to accomplish my ambition. I will utilize this award efficiently for the development of my country and humanity. Now, getting a chance with this award program became my dream to fulfill my future desire.