

PROJECT TITLE:

Interfacing Microfluidics and Angstro fluidics for the application in blue energy harvesting and ion selective channel

SoP:

This statement of purpose is to express my interest in the joint doctoral program at the University of Manchester and Indian Institute of Technology Kharagpur. I had completed my M.Sc. thesis under the supervision of Prof.Gopinadhan Kalon at Indian Institute of Technology Gandhinagar. My research interests lie mainly in the membrane Fabrication for the purpose of blue energy harvesting and desalination of seawater. My interest in this field arose after attending a Seminar by Prof.Gopinadhan at IIT Gandhinagar. After reading a few research papers I decided to pursue career in this field and joined Prof. Gopinadhan's group to pursue my Master's Thesis.

I completed my schooling with 96 % in 10th standard and 92.4 % in 12th standard. I also cleared JEE MAINS, one of India's most stringent examinations, and got selected at Delhi University to pursue my graduate studies. Being a student at Delhi University is the dream of any student, and I am privileged to be part of such an excellent institute. I graduated with an overall CPI of 8.081. My undergraduate studies have been a gratifying experience for me, where I have acquired strong Physics fundamentals. Specialized courses like Computational Physics, Advanced Condensed Matter Physics, and Quantum Mechanics helped me explore limitless horizons in Physics.

To enhance my understanding further, I decided to pursue a Master's in Physics at the Indian Institute of Technology Gandhinagar. At the time of choosing a project for M.Sc, I contacted Prof.Gopinadhan Kalon who had closely worked with Nobel Laureate Prof.Andre Geim in the field of desalination and Blue energy harvesting for several years . I have completed the project on "Ion transport and diffusion studies through Hydrogen Intercalated Vermiculite Membranes for desalination purpose" under the guidance of Prof.Gopinadhan Kalon at IIT Gandhinagar. We have successfully fabricated the nanofiltration membranes of vermiculite clay. Ion transport and water transport studies were done through them and it has been found that these membranes remove the dissolved ions to produce soft water from seawater. The membranes that are exchanged with several cations did not exhibit any tunable hydrophilicity, unlike a recent report in 'nature communications' raising serious questions. The membrane that we develop in our lab requires less energy consumption compared to other technologies, which are more energy-intensive.

While working on the project, it struck me that these membranes can also be used for blue energy harvesting and making ion selective channels. These technologies can be

used to produce energy in coastal areas that are not connected with the power grid. For this purpose diffusion studies can be studied in the lab environment and maximum diffusion potential can be tried to be developed. These Membranes can also be a replacement of Nafions membranes and can be used for wider temperature ranges. I wish to develop this idea further and a Ph.D. program at the University of Manchester and IIT Kharagpur would be a perfect opportunity for this.

My research interests align with the work of Professor Radha and Prof. Sunando DasGupta. It would be a privilege to study in the University of Manchester and Indian Institute of Technology Kharagpur under such a remarkable professor's guidance. It would be a perfect opportunity for me to work on my ideas and contribute to the field of blue energy more intensely. I would be grateful if I am provided the opportunity of doing a Ph.D. I promise that I will give my 100 percent to meet the standards of the University of Manchester and IIT Kharagpur.