STATEMENT OF PURPOSE

As a graduate student pursuing a Master's in Thermal Science and Engineering at the esteemed Indian Institute of Technology (IIT) Kharagpur, I am fervently interested in the field of refrigeration and air conditioning. Specifically I am deeply passionate about the potential for innovative and sustainable cooling technologies to address the pressing global challenge of extreme heat and the unavailability of cooling worldwide.

According to the World Health Organization, extreme heat waves may cause over 255,000 deaths annually by 2050. This underscores the urgent need for access to cooling, which is no longer a luxury but a matter of fairness and equality. Cooling is essential not only for enhancing people's productivity, health, and well-being but also for their survival. Nevertheless, identifying an appropriate and environmentally sound refrigerant for air conditioning has become a challenge. In response to this challenge, many researchers and engineers are turning to natural refrigerants, which have low global warming and ozone depletion potential. Therefore, the industry is transitioning towards natural refrigerants as a more sustainable alternative to synthetic refrigerants.

I am enthusiastic about applying for the Joint Ph.D. program offered by the esteemed Indian Institute of Technology (IIT) Kharagpur and the prestigious University of Manchester. The program's research project, "Green Cooling and Net-Zero: A Novel Sustainable Air Conditioning System using Transcritical CO_2-based Refrigeration Technology," deeply intrigues me. The research seeks to develop a hybrid air conditioning system that employs CO_2 as a refrigerant for seasonal and year-round air conditioning systems. The proposed system is expected to be highly efficient, incorporating enhancements from both the CO_2 refrigeration cycle side and the process air side. I am eager to explore innovative techniques that can reduce the load on refrigeration evaporators and increase their operating temperatures, including integrating effective heat recovery systems and managing sensible and latent loads separately. Furthermore, I am fascinated by the potential of improving the efficiency of transcritical refrigeration systems through novel expansion devices and heat rejection processes.

The hybrid system being proposed is innovative as it maximizes the potential of the transcritical CO_2 system for both cooling and heating needs, making it an appealing alternative to air conditioning systems for electric vehicles and buildings in regions with extreme temperature fluctuations. It is also a suitable option for air conditioning applications with high latent loads, which currently rely on energy-intensive systems.

As someone who has excelled in subjects related to this field, such as refrigeration systems, air conditioning, and ventilation, I am confident in my ability to make meaningful contributions to this research project. Furthermore, I have developed a strong interest in pursuing a career in the field of refrigeration and air conditioning as a researcher, as I believe that this field has the potential to make a significant impact on mitigating the effects of climate change and improving the quality of life for people around the world.

In conclusion, I am eager to work on this research project and make a meaningful contribution to the development of new and sustainable cooling technologies. I firmly believe that the Joint Ph.D. program between the Indian Institute of Technology (IIT) Kharagpur and the University of Manchester will offer me the ideal academic environment to pursue my research interests and enhance my research capabilities. Through this program, I will have access to advanced research facilities, expert guidance, and global collaborations, all of which will aid me in becoming a well-rounded researcher and contributing to the scientific community.