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|  |  | הטכניון - מכון טכנולוגי לישראל  TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY |
| הפקולטה להנדסה כימית  ע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Monday, March 4th, 2024 at 13:30**

**Zoom: https://technion.zoom.us/j/96298325147**

**Development and Application of a CFD Modelling Strategy for Hollow Fiber Membrane Module Based on a Double Porous Medium Model**

**Xiaobo Yao**

**MSc Seminar**

Advisor: Prof. Viatcheslav Freger (Technion) & Prof. Bo Kong (GTIIT)

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The hollow fiber membrane module has attracted attention as a powerful gas separation technology, as it has the potential to overcome the downsides of conventional membrane module devices. It has several advantages over other types of membranes for gas separation processes, including high permeability, high selectivity, and high stability. Hollow fiber membranes can be used for a wide range of gas separation applications, including CO2 capture, natural gas processing, and hydrogen purification. Despite the benefits that membrane reactors bring, the compact design can cause trouble with the performance of the hollow fiber membrane module, making it necessary to optimize the module arrangement. Mathematical modeling and simulation approach proves more convenient than conducting physical experiments, which are often time-consuming, expensive, and entail greater technical challenges. A Computational Fluid Dynamics solver was developed to simulate the intricate process of multi-component gas separation within a hollow fiber membrane module. The developed solver addresses the Navier-Stocks equation, incorporating source terms and leveraging the double porous media to approximate the densely packed hollow fiber module, optimizing computational efficiency. Significantly, the solver facilitates three-dimensional predictions of velocity, concentration, and pressure profiles in both feed and permeate sides, providing a comprehensive understanding of how module geometry influences the hollow fiber membrane module's performance. The versatility of this solver positions it as a valuable tool for optimizing industrial-scale membrane module designs based on simulation results.