



Wolfson Department of Chemical Engineering Seminar

On line seminar via ZOOM - <https://technion.zoom.us/j/98714206433>

Wednesday - August 19th 2020, at 15:00 - Israel time

**Multiscale Modeling of Multiphase Flows in Reactors and its Application to
Renewable Biomass Energy Systems**

Dr. Xi Gao

Research Scientist, National Energy Technology Laboratory/Leidos, USA

Biomass has been gathering worldwide attention for its great potential as a renewable energy source to meet increasing energy demand, while simultaneously providing a solution to mitigate serious environmental problems associated with fossil fuel utilization and addressing concerns about energy security. However, efficiently converting biomass to biofuels and biochemicals faces significant challenges. One of these challenges requires overcoming limitations in the design and scale-up of related process equipment such as biomass pyrolysis reactors, and bio-oil catalytic upgrading reactors. Thus, it is necessary to quantitatively investigate multiphysics transport phenomena and multiphase flow involving physical, chemical, and biological phenomenon in multi-time and multi-length scales. In this seminar, I will present the three most interesting projects of my research. First, I will talk about the development and validation of a filter drag model for Geldart A particle fluidization simulation and a hybrid drag for Geldart B biomass-sands binary mixtures fluidization simulation. Then, I will present the development and validation of a multiscale scale approach for biomass fast pyrolysis and bio-oil catalytic upgrading reactors simulation by integrating detailed reaction kinetics, particle scale model, and reactor model. Finally, I will introduce a new parallel solver-SuperDEM recently developed in open source CFD suite MFIX for non-spherical particulate flows and its application to biomass pyrolysis reactor simulation.

After presenting my previous and current research, I will talk about my research plan, and teaching philosophy and plan.