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
Lecture Hall 6, Wolfson Department of Chemical Engineering,
Wednesday January 23 at 1:30pm

Bo Kong

Ames Laboratory-USDOE, Ames, IA, USA

Multiphase Flow CFD Simulations for Chemical Reaction Engineering

In chemical reaction engineering practice in many industries, such as chemical, pharmaceutical, energy, and food, the flow and reaction taking place in reactors often involve multiple phases. With increasing available and affordable computational resources, conducting numerical experiments to test, optimize and scale-up different reactor designs becomes a more and more attractive alternative to the costly pilot-plant physical experiments. However, Computational Fluid Dynamics (CFD) simulations for multiphase flows have not been routinely used in the chemical reaction engineering practice, unlike single-phase CFD in aerospace and automotive industries. This is because multiphase flows have much higher physical complexity compared to single-phase flows, and the CFD software for them is far from mature, especially when involving polydispersity, mass/heat transfer, and chemical reactions, which is often the case in the industrial reactors you see in chemical plants. Many critical research issues remain before the multiphase CFD simulations for them can be routinely and confidently employed for engineering purposes.

In this seminar, I will first briefly introduce the characteristics of multiphase flow systems, and some of the challenges and opportunities of multiphase flow CFD. Then I will present one example of my efforts in the research and development of fundamental CFD models, algorithms and codes – the kinetic theory modeling of multiphase flows using Quadrature-Based Moments Methods (QBMM), and one example of how multiphase CFD is used to solve real-world engineering problems – the development of a novel satellite reduction strategy for gas atomized metal powder. These are also examples of two areas of my future research efforts, i.e., developing predictive and reliable physics-based CFD models and computer codes and using these tools in various chemical reaction engineering practices. I believe these efforts will lead to better reactor designs and operations, which in turns lead to more efficient and sustainable production and use of energy, chemicals, and materials, making a broad impact on society.

Refreshments will be served at 1:15pm