Quadrature-based moment methods for modeling turbulent multi-phase reacting flows via computational fluid dynamics

Daniele L. Marchisio

ABSTRACT

This seminar will describe different approaches for the detailed simulation of turbulent multi-phase reactive flows, focusing in particular on solid-gas (fluidized beds) and gas-liquid (bubble columns and stirred tanks) systems. The seminar is divided in three parts. In the first part some important features of multi-phase particulate systems, such as Particle Trajectory Crossing and Particle Mixing and Segregation, will be presented and discussed. In the second part the Generalized Population Balance Equation (GPBE) will be derived and its relationship with similar balance equations (e.g., Boltzmann, Williams and Particle Dynamics equations) will be highlighted. Moreover in this second part of the seminar the derivation of the characteristic equations of the Eulerian-Eulerian Multi-Fluid model, widely adopted in many commercial Computational Fluid Dynamics (CFD) codes, will be presented. Eventually in the last part of the seminar two applications will be examined: the simulation of fluidized beds and gas-liquid stirred tanks. In particular, the use of the Quadrature Method of Moments (QMOM) and the Direct Quadrature Method of Moments (DQMOM) for the simulation of such flows will be illustrated. The ability of these methods to capture particle mixing and segregation, as well as some important issues related to numerical diffusion, will be thoroughly discussed.

Lunedì 17 Maggio 2010,

Sala Multimediale del Dipartimento di Matematica e Informatica.
http://www.dimi.uniud.it/dipartimento/prenotazione-delle-risorse-dimi#aulamm