Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Solids mixing in bubbling fluidized beds: CFD-based analysis of Bubble Dynamics and Time Scales AKHILESH BAKSHI, Massachusetts Institute of Technology, CHRISTOS ALTANTZIS, Massachusetts Institute of Technology, National Energy Technology Laboratory, AHMED GHONIEM, Massachusetts Institute of Technology — In bubbling fluidized bed reactors, solids mixing is critical because it directly affects fuel segregation and residence time. However, there continues to be a lack of understanding because (a) most diagnostic techniques are only feasible in lab-scale setups and (b) the dynamics are sensitive to the operating conditions. Thus, quantitative estimates of mixing (e.g., dispersion coefficient, mixing indices) often span orders of magnitude although it is well accepted that the micro-mixing and gross circulation of solid particles is driven by bubble motion. To quantify this dependence, solids mixing is investigated using fine-grid 3D CFD simulations of a large 50 cm diameter fluidized bed. Detailed diagnostics of the computed flow-field data are performed using MS3DATA, a tool that we developed to detect and track bubbles, and the solids motion is correlated with the spatial and size distribution of bubbles. This study will be useful for quantifying mixing at commercial scales.

Akhilesh Bakshi
Massachusetts Institute of Technology

Date submitted: 29 Jun 2016 Electronic form version 1.4