Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

**Numerical investigation of the role of clustering during oxygen-carrier regeneration in Chemical Looping Combustion**[1] HIMANSHU GOYAL, PERRINE PEPIOT, Cornell University — In the air-reactor of a dual-bed Chemical Looping Combustion (CLC) system, the spent oxygen-carrier, in the form of metal or reduced metal oxide, is oxidized with air, typically in a high velocity riser reactor. Such a configuration provides challenging modeling issues, as the granular flow is characterized by a highly fluctuating solid volume fraction due to the formation of dense clusters. This may strongly affect the solid residence time in the air-reactor, and therefore, the extent of the oxygen-carrier regeneration and ultimately, the overall reactivity of the carrier in the fuel reactor. Here, we investigate how clustering impacts gas-solid chemical reactions in the reactor using a detailed Lagrange-Euler computational framework. The simulations account for both mass and heat transfer between the gas phase and the metal oxide particles, and the evolution of oxygen content of the metal oxide particles, or equivalently, their degree of oxidation. Two particle models of different complexity are considered. Results are analyzed to quantify the relative importance on the regeneration process of the reactor hydrodynamics.

[1]This material is based upon work supported by the National Science Foundation under Grant No. CBET-1638837

Himanshu Goyal
Cornell University

Date submitted: 01 Aug 2016 Electronic form version 1.4