Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Combustion properties in multi-particulate flows with direct numerical simulation LONGHUI ZHANG, CHANGFU YOU, Department of Thermal Engineering, Tsinghua University, DEPARTMENT OF THERMAL ENGINEERING, TSINGHUA UNIVERSITY TEAM — Multiphase combustion is widely applied in industries. With high solid concentrations, the influence of particle interactions must be taken into account in the combustion models. Many literatures have developed group combustion models with particles treated as point sources. However, for dense phase flow the particle size is in the same scale with the average particle spacing, and the point source assumption is not accurate enough. This work presents the fully resolved direct numerical simulation results of reacting particulate flows. The particles are considered as finite sized regions in flow fields. Therefore the influence of particle motion and distribution on combustion properties can be obtained. The moving, colliding and burning process of char particles in confined space is calculated. The flow and combustion characteristics under different conditions are observed. The char burning rate is compared to that of fixed char particles with uniform distribution. The result shows that the burning rate decreases when the particle distribution non-uniformity perpendicular to the main flow direction increases. A model of char group combustion rate is developed using non-uniformity coefficients.

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Date submitted: 30 Jul 2015 Electronic form version 1.4