Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Mixing Behaviors of Wet Granular Materials in a Pulsating Fluidized Bed ELDIN WEE CHUAN LIM, National University of Singapore — The Discrete Element Method combined with Computational Fluid Dynamics was coupled with a capillary liquid bridge force model for computational studies of mixing behaviors in a gas fluidized bed containing wet granular materials. There was a high tendency for wet particles to form large agglomerates within which relative motions between adjacent particles were hindered. This resulted in much lower mixing efficiencies compared with fluidization of dry particles. Capillary liquid bridge forces were on average stronger than both fluid drag forces and particle-particle collision forces. Particle exchange between agglomerates was necessary for mixing to occur during fluidization of wet granular materials but required strong capillary liquid bridge forces to be overcome. When pulsation of the inlet gas flow was applied, voidage waves comprising regions of high and low particle concentration formed within the fluidized bed. This allowed particles to cluster and disperse repeatedly, thus facilitating exchange of particles between agglomerates and promoting mixing of particles throughout the fluidized bed. This points towards the possibility of utilizing pulsed fluidization as an effective means of improving mixing efficiencies in fluidized bed systems containing wet granular materials.

Eldin Wee Chuan Lim
National University of Singapore

Date submitted: 01 Aug 2017 Electronic form version 1.4