Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Direct numerical simulation of powder electrification in a turbulent channel flow[1] HOLGER GROSSHANS, Universite Catholique de Louvain, MILTIADIS PAPALEXANDRIS, Universit Catholique de Louvain — Particle electrification is often encountered in process industries. Sometimes it has useful applications, such as the control of particle trajectories through an electric field. In other situations is has negative effects. For example, during pneumatic transport it can cause particle deposition or, even worse, spark discharges and subsequent fires and explosions. Despite its frequent occurrence, due to the complexity of the underlying physical mechanisms, there are still many open questions regarding particle electrification and inconsistent theoretical predictions have been reported. The objective of our work is to gain a better understanding and physical insight of this phenomenon. To this end, we performed Direct Numerical Simulations to analyze the turbulent flow of a carrier fluid with immersed particles in a channel. Moreover, the motion of the particles was computed in a Lagrangian framework and dynamic models accounting for the particle-wall and particle-particle charge exchange were implemented. In our talk, we discuss in detail the effect of the fluid turbulence to the build-up of the electrostatic charge of the particles. Furthermore, we elaborate on the influence of the particle Stokes number and gravitational forces to the process of powder charging.

[1]Supported by the National Research Fund of Belgium (FNRS) under the GRANMIX Projet de Recherche grant.

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Date submitted: 24 Jun 2016 Electronic form version 1.4