

Dynamic Characterization of the Flowability of Granular Materials Flowing Down a Narrow Channel

Ningsheng Wang^{1,2}, Haifeng Lu^{1,2}, Xiaolei Guo^{1,2}, Weifeng Li^{1,2}, Haifeng Liu^{1,2}

¹Key Laboratory of Coal Gasification and Energy Chemical Engineering of Ministry of Education, East China University of Science and Technology, P.O. Box 272, Shanghai 200237, PR China,

²Shanghai Engineering Research Center of Coal Gasification, East China University of Science and Technology, P.O. Box 272, Shanghai 200237, PR China

email (Presenter): Y10150101@mail.ecust.edu.cn

Flowability characterization of granular materials has been studied extensively due to its great importance in particle handling process in industry. However, flow characteristics of granular materials are usually investigated adopting the shear cell test, in which the flow situation is usually quite different from the actual flows. This discrepancy may make the results less predictive. In this paper, granular flows of different materials over static piles in a narrow channel are experimentally investigated through high-speed photography. Flow parameters of the granular flows are obtained, and are used to characterize the flowability. The surface velocity, the thickness of the flowing region and the shear rate of the linear part of the velocity profile, increase with the flow rate and depend on granular material. A universal parameter, defined as the ratio of the sine of the inclination to the shear rate of the linear part of the velocity profile, is found to be constant and independent of the particle properties. Moreover, a flowability parameter, defined as the ratio of the shear rate of the linear part of the velocity profile to the cosine of the inclination, is proposed to characterize the flowability of granular materials.