Sandia National Laboratories

SAND2018-9710C

4th AM Cross JOWOG Abstract Submission
Oct. 22-25, 2018

Title	**Elucidating Metal Powder Rheology via Discrete Element Simulations and Mechanically Stirred Powder Rheometry**
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Classification level of slides/poster	UUR
Classification level of discussion	UUR
Preferred format	Poster ☐ Presentation ☒

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Bulk solids composed of many discrete particles, i.e., grains and powders, are present in numerous engineering applications from mining to materials processing to energy storage to consumer products to food. In addition, particles are often added to materials to enhance their properties and subsequent performance in some fashion. Although particulate materials are ubiquitous, there remains a general lack of predictive understanding of their behavior; leading to a deficiency in effective, efficient control of the processing of such materials. At the core of this poor understanding is a shaky fundamental explanation of how the dynamics of individual particles, in ensemble, lead to the complicated dilative, yield stress, pressure dependent rheological behaviors of the bulk material. This challenge is particularly acute at low confining stresses for small, mildly cohesive particles. In this paper, we will present work to simulate, via the Discrete Element Method (DEM), the dynamics of individual particles of metal powders in a mechanically stirred powder rheometer. Our aim is to elucidate the connection between particle dynamics and powder rheology. In addition, we will assess the use of powder rheometry as a means of validating DEM models.

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