Particle breakage model for Discrete Element Method (DEM) simulations

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ABSTRACT

The discrete element method (DEM) has become an important tool for understanding process and equipment involving particulate material. When simulating some minerals comminution operations, such as several types of crushers, the description of particle breakage inside the DEM environment becomes indispensable for a quantitative analysis, since flow of solids, energy transfer and size reduction are deeply intertwined. Thus, the present work proposes a particle breakage model for DEM simulations. Based on particle replacement technique, the model takes into account a myriad of particle breakage microprocessses, such as variability in individual particle strength, fatigue over repeated loading, fragments size distribution as a function stress intensity [1]. The model takes as input material parameters from standard breakage test from the literature and was validated against simple experiments: such as particle bed compression and impact by a free falling steel ball; as well as laboratory scale crushers: jaw and impact crusher.

REFERENCES

[1] L.M. Tavares, *Breakage of Single Particles: Quasi-Static.* In *Handbook of Powder Technology*. 3-68 (2007).