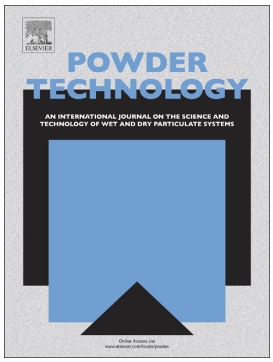

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Adapting a breakage model to discrete elements using polyhedral particles

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Abstract

Several approaches have been proposed in the past to describe particle breakage inside the DEM environment. The large number of particles dealt with in most operations of interest and the associated computing power demanded, however, requires computationally-efficient approaches to describe breakage that do not sacrifice accuracy in describing the details of the physical phenomenon. The present work describes a detailed empirical-phenomenological model that characterizes all relevant aspects of body breakage that has been implemented in a commercial DEM package (Rocky DEM) using a particle replacement scheme. It describes the size-dependent breakage probability distribution, the weakening by repeated stressing events and the energy-dependent fragment size distribution. The model has been initially verified from a comparison of the analytical model, previously fitted to data, to simulations of single-particle breakage. The simulation model is then validated by comparing its results to drop ball test experiments on unconfined particle beds, demonstrating very good agreement.