Simulation of Impact Strength of Agglomerates by Distinct Element Method

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Abstract

Agglomerate structure has a strong influence on its strength, yet the current modelling capability is not predictive.   Quasi-static and impact behaviour differ markedly, and for the latter the velocity and impact angle dependence are not well understood.   For some structures, the impact strength depends mainly on the normal component of the impact velocity, whilst for other structures the tangential component is also influential, but the factors affecting the difference are unknown.   In addition the functional dependence of the extent of breakage on impact velocity is often a square power law, but this not universal, again the source of difference not understood.

In this work we use the Distinct Element Method (DEM) to analyse the effect of agglomerate structure on the impact strength of agglomerates of elastic spheres that are bonded together by a contact adhesive force, following the JKR model (Johnson *et al.*, 1971).   A sensitivity analysis is carried out addressing the effect of the single particle properties (stiffness and surface adhesion) and agglomerate structure (porosity and its spatial pore size distribution) on the impact strength and size distribution of the clusters that are formed as a result of impact.   This enables the underlying causes of variations in the dependency of impact velocity and angle to be elucidated.

Keywords: Agglomerate; DEM; impact, strength

References

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