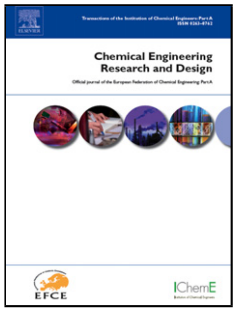

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MODELLING OF AUTO-AGGLOMERATION OF COHESIVE POWDERS

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Highlights

- A model of autoagglomeration under mechanical vibration is derived
- The existence of an equilibrium granule size is predicted
- The model predictions are compared with experiments from literature
- Equilibrium granule size reached as a result of the balance between breakage and densification
- A maximum granule size with vibration intensity is predicted

ABSTRACT

Fine particles in the micron size range or smaller are usually so cohesive that they cannot exist as individual entities and are in cluster form, the size of which depends on the stress history. During handling, transportation or storage, the powder is subjected to mechanical vibration and/or agitation and, as a result of which clumping of particles or "snowballing" can occur even without the presence of any binder. This is an undesirable feature, as it is responsible for poor flow behaviour, cohesive arching, segregation of lumps and inducing flaws in products. Nevertheless, the mechanism of auto-agglomeration of cohesive powder has not received due attention and the conditions under which such clusters/lumps form, their size, structure and strength has not been analysed extensively. In this work we present a preliminary model to predict the equilibrium cluster size based on two separate energy balances to predict the granule solid fraction and equilibrium size, respectively. Despite some broad approximations, this approach can capture the trend of variation of the agglomerate size with the vibration intensity for some data reported in the literature. . The proposed model also identifies the mechanism controlling the growth of the agglomerates as the balance between the cohesive energy of the particles and the disruptive energy of vibration.

KEYWORDS: AUTO-AGGLOMERATION, COHESION, GRANULATION, MODELLING