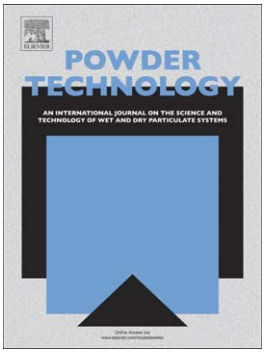

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A Review of Bulk Powder Caking

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Abstract

The handling and storage of bulk powders is common in many industries such as detergent, pharmaceutical, bulk chemical and food. A lot of materials are susceptible to changes with time that may lead to bulk powder caking, resulting in an unmanageable powder and process downtime, which impacts upon profitability. In this review the current state of the art related to powder caking is explored. The relevant interparticle interactions are discussed with respect to elastic and plastic deformations and the development of liquid and solid bridges due to capillary condensation, sintering and solvent evaporation. The environmental, i.e. temperature and humidity, and the mechanical conditions can heavily influence the transformation of a bulk powder and a number of studies are available that attempt to relate these conditions to caking. A significant amount of work related to the caking behaviour of amorphous powders is available in the literature. Amorphous materials are susceptible to caking due to environmental conditions influencing the glass transition temperature. Once the temperature of amorphous powders exceeds the glass transition, viscous flow occurs and cake strength increases. Crystalline solids may undergo transformations leading to caking. It can take a considerable time and cyclic environmental conditions for caking to occur. However, little research focuses on cyclic conditions and there is limited predictive capability. Finally the options available for attempting to reduce caking propensity are briefly covered and a section that discusses the available caking test methods is given.

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