

Effect of Particle Interactions on Powder Flow Behavior

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ABSTRACT

The study of powder flow behavior is essential for the development of processing technologies in many industries. In fact, powders have a major function in diverse types of manufacturing, such as pharmaceuticals, foods, chemicals, materials, minerals and cosmetics. This leads to an increasing demand for the development of reliable methods to assess powder flow problems in industry. This research intends to provide a general insight into how surface interactions and particle properties may alter powder flowability. The materials used for this study were lactose, starch, milk powder, cocoa and chocolate. These vary in their interparticle forces as well as on their manufacturing process. Powder flow behavior of these materials was measured by using a 502 Twin Drive Anton Paar Modular Compact Rheometer. The collected sets of data were used to identify how particle characteristics affect powder flow behavior. The results suggest that powder flow is affected by a combination of particle size, morphology, environmental conditions and composition. The obtained flowability profiles were compared with previous results obtained using the Freeman FT4 Powder Rheometer. Although the flow tendency is somewhat similar, the results have some differences that are attributed to the principle of operation of each of the measurement systems. The findings represent a starting point for the understanding of particle interactions involved in complex materials. It is envisioned that the results will assist in the development of models to predict how to alter particle characteristics, using processing techniques and additives, in order to tune in a desired powder flow behavior.

KEYWORDS

Food Powders, Flowability, Powder Rheometer, Lactose, Cocoa, Coffee, Starch, Milk Powder