

Characterizing Powder Flowability by Shear Cell

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Powder flow effects solids dosage operations through material handling problems, segregation, tablet uniformity, and fill control. But when we say a powder has poor flowability, what are we really saying? The term "flowability" conjures up fluid rheological concepts, which, in fact, simply do not apply to powders. Bulk powders are solids. They exhibit anisotropic stress, elastic deformation & yield strength. They DO NOT flow in the sense of a fluid while in the bulk state.

This seminar will review the solid nature of powders with some simple physical demonstrations, followed by a summary of flow properties as measured by shear cells, developed from geotechnical soil mechanics. Shear cells determine simple flow indices, which are measures of the forces required to initiate flow, defined as powder failure, based on measurements of cohesive strength, powder friction, and wall friction. This information is extremely useful for bin design, minimization of caking & segregation, and processes such as filling operations, roll pressing, tableting, and encapsulation.

Examples of applications will include the modification of flow properties of lactose and acetaminophen with the addition of flow aids such as silica and magnesium stearate, as well as the impact of wall and powder friction on tablet uniformity and on blend segregation and hopper discharge.†

Bulk flow properties are in turn controlled by particle level attributes of size distribution, surface chemistry, and particle hardness. Additional characterization techniques of this attributed will also be discussed, including, in particular, uniaxial/indentation measurements of hardness/strength of granules and particles, inverse gas chromatography measurements of surface chemistry.

This seminar will also be followed by a hands-on demonstration of shear cell testing.

†Joint research with the Food & Drug Administration.