International Fine Particle Research Institute

Research Project Brief

Measurement of Intrinsic Stress-Strain Behavior of Small Randomly Shaped Agglomerates

Small agglomerates with distributed size and random shape are common in particle processing. The strength of these agglomerates is a critical material attribute that underlies their fate in processing and performance as intermediates or products. In many cases, fine powders are purposely agglomerated, and the agglomerates are designed to have a minimum strength to survive subsequent processing (e.g., bulk transport or coating) or to fracture at a pre-determined stress (e.g., tableting). In other applications, the maximum fracture stress of agglomerates is critical (e.g., comminution).

Many rigorous mechanical testing methods exist for measuring the fracture stress of agglomerates with well-defined shape. Many of these have been applied to characterizing randomly-shaped agglomerate strength, but they are typically reported as a breakage force, not a stress, and therefore the values can at best be used directionally to determine whether or not granules will survive or break in process.

IFPRI wishes to fund a project to develop a novel method for measuring the stress-strain behavior of (semi)brittle agglomerates in the size range from 250 microns to 5 mm. The method should rigorously account for the size and shape of individual agglomerates so that the reported value is a stress. (One approach might be to apply optical profilometry and array force sensors, although alternative or complementary approaches are encouraged.) The test method should be rapid enough to facilitate measurement of the breakage stress distribution and practical enough to be transferable to industrial characterization laboratories.