IFPRI Research Project Brief

Crystal Structure Transformation in Milling

The International Fine Particle Research Institute (IFPRI) wishes to fund a project to develop a molecular understanding of transformations in crystal structure observed during size reduction by milling. Milling is often the final step in production of crystalline powders--used to control the particle size distribution of the product. It is not unusual that milling also causes undesirable structural changes, in the bulk and on the surface of crystals. The mechanism of these transformations is not understood, and it is not possible to predict whether a given crystalline phase will be sensitive to milling or not. This project aims to build a mechanistic understanding of mechanically-induced plastic transformations to provide a basis for prediction of, characterization of, and potentially avoiding surface damage in milling. More specifically, the focus of the project is experimental elucidation of surface damage, localized defects, disorder and/or phase change in a brittle or semi-brittle crystalline structure caused by a mechanical shock from collisional impact relevant to impact milling.

This is an experimental project and should employ advanced imaging and/or spectroscopic tools for characterizing crystal defects (bulk or near-surface), strain, surface damage such step or void creation, polymorphic changes, and disorder. Both crystalline organic and inorganic materials are in scope, however semi-crystalline polymers are out of scope.