International Fine Particle Research Institute

Review Brief

Conditioning of materials to enable or enhance breakage in suitable mills

Many materials are difficult to mill, either because they are extremely hard and relatively defect free (hard ores, very small particles) or soft (many organic materials, including polymers). Traditional milling processes may be insufficient for size reduction of these materials, and a variety of pre-conditioning methods have been developed to improve size reduction efficiency by enabling or enhancing material breakage. Examples of these include:

- Fast cooling with liquid nitrogen
- Significant heating (e.g. microwave treatment)
- X-Ray-treatment to decrease molecular strength
- Ultrasound treatment
- Mechanical pre-treatment
- Chemical surface treatment (increase surface stiffness and introduction of surface defects) by reactive fluids (i.e. water and other solvents or vapors)
- Electrohydraulic treatment.

IFPRI wishes to commission a comprehensive critical review of methods for conditioning materials to improve mill efficiency. The review should discuss the underlying mechanism of each method, its scope of application, how it is implemented, and its effectiveness in improving milling efficiency.

The focus of the review should be on methods that enable or enhance particle breakage, so traditional milling aids that improve mill efficiency through improving powder flow are out of scope.