

IFPRI Research Project Brief

Wetting and Dispersion of Organic and Biologically-Derived Powders

The International Fine Particle Research Institute (IFPRI) wishes to fund a project in the broad area of dispersion and dissolution of organic particles. The overall objective of the project is to develop systematic understanding of wetting, imbibition, dispersion, and dissolution to facilitate proactive design of powder formulations for optimal dispersibility.

The project should explore and demonstrate approaches to control, design, and engineer nano to meso scale particle surface topology and surface chemistry of organic and biologically-derived materials to promote wetting and dissolution, in concert with addition of surface modifiers (surfactants, ions, polymers, etc.). Dispersion by liquid incorporation into powders and powder addition to liquids should *both* be investigated. A mechanistic model for dispersion and dissolution should be developed and validated. This model should describe both modes of dispersion.

IFPRI's interest is in dispersion of powders common in food and pharmaceutical applications, with an emphasis on water dispersible, bio-derived materials of which, fully soluble particles and mixed soluble/insoluble particles are explored. A phenomenological mechanistic model of the particle/powder wetting, dissolution and dispersion kinetics should be developed and validated as a predictive tool for assessing wetting/dissolution issues of powders/powder beds in both confined and unconfined vessels. The model should address powder to liquid ratios that are representative of localized conditions in transforming a wetted bed of powder having capillary or even funicular wetting at liquid-particle interfaces to a fully dispersed suspension of particles in excess liquid. An understanding of the development of films, gelatinous layers, and fish eyes should be considered, as these are some of the most common issues encountered with reconstitution of powders. Systems where little to no agitation is available to promote wetting and dispersion, such as gravimetric liquid incorporation are of particular interest.