



## Research Project Brief

### Method for Accelerated Aging of Dispersions

The International Fine Particle Research Institute (IFPRI) wishes to fund a research project on the development of accelerated test methodologies for the physical stability of colloidal dispersions and gels.

The physical stability of products formulated as colloidal dispersions and gels is critical to their performance, and stability must be demonstrated to last over the shelf life of a product. It is impractical to measure the actual stability as a release test in manufacturing or as a characterization test in development, therefore accelerated testing is required. Temperature and centrifugation are often used independently or in tandem to predict shelf-life, however failure modes are known to be non-Arrhenius in nature and therefore estimation of actual shelf-life from accelerated test results is problematic. Biologic systems may not even allow for standard accelerated testing. We hypothesize that particle network changes are fundamental to many failure modes, either formation of a network or weakening/collapse of the network.

The objective of this project is to develop accelerated testing strategies that are based on the mechanism of the colloidal instability in a given formulation and accelerate the instability by at least 100 fold. We believe that the key elements of this project are:

- Measurement of the local structure with time.
- Matching of the mechanism of colloidal forces responsible for stability to the alternative accelerated ageing test or tests
- Identification of alternative methods which predict long-term stability of suspensions

Types of systems of interest include flocculation of suspensions designed for long-term colloidal stability, serum formation or collapse of weakly flocculated gel networks. Examples could include protein/lipid nanoparticle suspensions, depletion flocculated suspensions or emulsions. These could be model systems or formulations provided by the IFPRI members.