



IFPRI BRIEF TEMPLATE

Check One: **Project** **Review** **Collaboration**
 Workshop **Other**

Descriptive Title	Measuring and tuning friction and adhesion in wet systems
Working Title¹	Wet system friction
Technical Area²	W
Date	14/6/2022
Short Description	<p>Friction is well appreciated in dry systems, but the understanding of friction and adhesion between suspended particles in wet systems is currently a significant gap in the field. Friction is thought to play a major role in network (gel) rheology, aging, and stability, as well as discontinuous shear thickening during flow and processing.</p> <p>An understanding of friction, adhesion, and their mechanism can guide formulation choices to mitigate or alter friction through additives (surface active species) or particle surface chemistry.</p> <p>This project will complement and advance key wet systems projects, including Slurries and Pastes (Koos) and SIFs (Vermant). It will provide a basis for force and interaction laws used in computational models of suspensions.</p>
Objectives	<p>Connect the nanoscale mechanics and interactions of particles to the bulk rheology of simplified industrial formulations, including particle composition, roughness, and shape.</p> <p>Employ atomic force microscopy and other state-of-the-art micromechanical measurements of particles with surfaces to benchmark against high frequency rheology, network properties of gels (structure, elasticity, yielding), and transient networks during shear thickening.</p> <p>Develop empirical constitutive models to correlate friction measurements to bulk rheology.</p>

¹ Title used in meeting agendas and file archives

² One or more from the following list: W = wet systems; D = dry systems; F = particle formation; SR = size reduction; M = modeling; SE = systems engineering

	<p>Develop local-scale molecular insights into the nature of contacts and contact mechanics, possibly through collaboration with molecular simulation groups.</p> <p>Study the modification of particle tribology and effect on rheology through surface active species or other appropriate change in interface chemistry.</p> <p>Provide a state-of-the-art report of this rapidly developing area.</p>
Scope	<ul style="list-style-type: none"> - Measurements (microscopic and macroscopic) of real and model systems used in the experimental IFPRI projects - Engage the industrial IFPRI members and contractors for validation

Recommended Contractors (2 or 3)		
Name	Institution	Email Address
Lucio Isa	ETH Zürich	
Annie Colin	ESPCI	
Lilian Hsiao	North Carolina State University	

Submitted By:	
Name	Organization
John Hone	Syngenta
Navin Venugopal and John Wight	Corning
Eric Furst	University of Delaware
Jan Vermant	ETH Zürich
Dan Hodgson	University of Edinburgh
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