 MICROSTRUCTURE MEASUREMENTS OF CONCENTRATED, NEAR HARD SPHERE COLLOIDAL DISPERSION VIA 1-2 PLANE FLOW-SANS

D. P. Kalman (PhDChE), N. J. Wagner

University of Delaware . Center for Composite Materials . Department of Chemical Engineering

SUSPENSION PROPERTIES
Commercial Spherical Silica Particles
Near Hard-Sphere, surface stabilized ~120nm diameter (SEM, SANS)
Suspended in Newtonian, partly deuterated PEG/EG mixture
Strongly, continuously shear thickening at P_c ~ 0.520 Silica

SANS GIVES STRUCTURE COMPARISON TO SIMULATIONS
Simulation g(r) shows high and low particle concentrations in same location as scattering measurement.

FLOW-SANS
1-2 Plane SANS can measure structure directly in shear plane. Now can measure in all 3 planes of shear to match microstructural changes to rheological changes.

SANS THERMODYNAMIC VISCOSITY
\[ \eta = \left( \frac{q \cdot \theta \cdot \gamma}{1 - \eta_{th}} \right) \cos \theta \sin \theta \]

SANS HYDRODYNAMIC VISCOSITY
\[ \eta_{hydro} \approx \frac{2 \mu C P (\gamma)}{\eta_{inf}} \]

CONCLUSIONS
• First structural measurements on suspensions performed in shear plane
• Structure anisotropy in shear plane agrees with simulations and theory at low and moderate Pe
• Structure-property relations work to compare SANS measurements to rheology

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