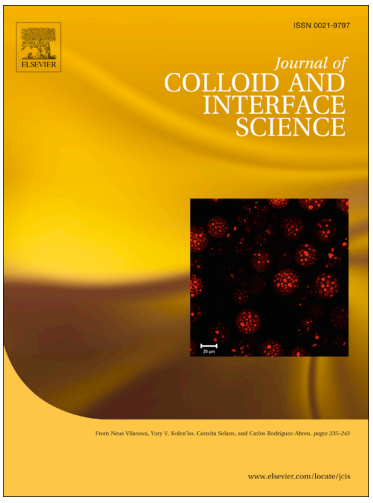

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Understanding the role of hydrogen bonding in the aggregation of fumed silica particles in triglyceride solvents

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ABSTRACT

Hypothesis

Fumed silica particles are thought to thicken organic solvents into gels by aggregating to form networks. Hydrogen bonding between silanol groups on different particle surfaces causes the aggregation. The gel structure and hence flow behaviour is altered by varying the proportion of silanol groups on the particle surfaces. However, characterising the gel using rheology measurements alone is not sufficient to optimise the aggregation. We have used confocal microscopy to characterise the changes in the network microstructure caused by altering the particle surface chemistry.

Experiments

Organogels were formed by dispersing fumed silica nanoparticles in a triglyceride solvent. The particle surface chemistry was systematically varied from oleophobic to oleophilic by functionalisation with hydrocarbons. We directly visualised the particle networks using confocal scanning laser microscopy and investigated the correlations between the network structure and the shear response of the organogels.