

Accepted Manuscript

The rheology of polyvinylpyrrolidone-coated silica nanoparticles positioned at an air-aqueous interface

Kai Yu, Huagui Zhang, Simon Biggs, Zhenghe Xu, Olivier J. Cayre, David Harbottle

PII: S0021-9797(18)30550-2
DOI: <https://doi.org/10.1016/j.jcis.2018.05.035>
Reference: YJCIS 23613

To appear in: *Journal of Colloid and Interface Science*

Received Date: 7 April 2018
Revised Date: 9 May 2018
Accepted Date: 14 May 2018

Please cite this article as: K. Yu, H. Zhang, S. Biggs, Z. Xu, O.J. Cayre, D. Harbottle, The rheology of polyvinylpyrrolidone-coated silica nanoparticles positioned at an air-aqueous interface, *Journal of Colloid and Interface Science* (2018), doi: <https://doi.org/10.1016/j.jcis.2018.05.035>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



The rheology of polyvinylpyrrolidone-coated silica nanoparticles positioned at an air-aqueous interface

Kai Yu¹, Huagui Zhang¹, Simon Biggs², Zhenghe Xu³, Olivier J. Cayre¹, and David Harbottle^{1*}

¹ School of Chemical and Process Engineering, University of Leeds, UK

² School of Chemical Engineering, The University of Queensland, Australia

³ Department of Chemical and Materials Engineering, University of Alberta, Canada, and
Department of Materials Science and Engineering, Southern University of Science and
Technology, Shenzhen, China

ABSTRACT

Particle-stabilized emulsions and foams are widely encountered, as such there remains a concerted effort to better understand the relationship between the particle network structure surrounding droplets and bubbles, and the rheology of the particle-stabilized interface. Poly(vinylpyrrolidone) coated silica nanoparticles were used to stabilize foams. The shear rheology of planar particle-laden interfaces were measured using an interfacial shear rheometer and the rheological properties measured as a function of the sub-phase electrolyte concentration and surface pressure. All particle-laden interfaces exhibited a liquid-like to solid-like transition with increasing surface pressure. The surface pressure-dependent interfacial rheology was then correlated to the formed micron-scale structures of the particle-laden interfaces which were imaged using a Brewster angle microscopy. With the baseline knowledge established, foams were prepared using the same composite particles and the particle network structure observed using cryo-SEM. An attempt has been made to correlate the two structures observed at a planar interface and that surrounding a bubble to elucidate the likely rheology of the bubble stabilizing particle network. Independent of the sub-phase electrolyte concentration, the resulting rheology of the bubble stabilizing particle network was strongly elastic and appeared to be in a compression state at the region of the L-S phase transition.

Download English Version:

<https://daneshyari.com/en/article/6990213>

Download Persian Version:

<https://daneshyari.com/article/6990213>

[Daneshyari.com](https://daneshyari.com)