Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Rigidity percolation in particle laden foams SYLVIE COHEN-ADDAD, REINHARD HOHLER, MARCEL KRZAN, MARIJO MARINIC, Universite de Marne-la-Vallee / CNRS, BENJAMIN HERZHAFT, Institut Francais du Petrole — Aqueous foams are concentrated dispersions of gas bubbles in a soapy solution. These complex fluids exhibit solid-like or liquid-like mechanical behaviors depending on the applied shear. We study how their viscoelasticity and their yielding are modified when non colloidal solid particles are dispersed in the foam. We show that even small amounts of particles can enhance the viscoelastic shear modulus by more than an order of magnitude. The scaling of the elasticity enhancement with particle concentration qualitatively agrees with that expected for percolation on superelastic networks constituted of strong bonds randomly dispersed in a soft matrix. A plausible candidate for these bonds might be the capillary bridges between particles. Moreover, we show that the yield stress of particle laden foams increases only linearly with the particle concentration, suggesting that percolating bond chains are stiff but rupture easily. The effects of particle to bubble size ratio as well as particle wettability and shape are also investigated.

Sylvie Cohen-Addad
Universite de Marne-la-Vallee / CNRS

Date submitted: 29 Jul 2005 Electronic form version 1.4