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Unusual material properties enabled by nanoparticles in capillary foams

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Foams can play important roles in industrial applications ranging from food processing to oil recovery and the production of lightweight materials for packaging, shock absorption and insulation. We recently discovered an entirely new class of foams, obtained by frothing aqueous micro- or nanoparticle suspensions in the presence of a small amount of an immiscible oil. In the so-called capillary foams the particles connect via oil bridges into a space spanning particle network in which gas bubbles become entrapped, while each bubble gets coated spontaneous in a composite layer of oil and particles. This unique composition results in extraordinarily stable liquid foams that can serve as precursors for hierarchically-structured solids with porosity on different length scales and unprecedented possibilities for functionalization and customization of material properties. This presentation will address some of the ensuing opportunities, e.g. for oil field applications, water treatment, spill remediation and thermal management with conducting foams.

Biography

Sven H Behrens is an Associate Professor in the School of Chemical and Biomolecular Engineering at the Georgia Institute of Technology. He holds a Diploma in Physics from Goettingen University (Germany) and a PhD in Environmental Sciences from the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland. After two years of Postdoctoral research at the University of Chicago and five years of industrial research in the polymer research division of BASF, Germany, he has joined the Faculty at Georgia Tech in 2007. Research in his group addresses colloidal interactions in aqueous and nonpolar solutions, interfacial assembly processes and protein stability.

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