The Australian Society Of Rheology, Inc.

2020-21 Rheology Lecture Series

CAV Reg. No. A0055806E

The Australian Society of Rheology is presenting a national series of lectures, which is open to anyone interested in the flow and deformation of matter. The next event in the series will be held online.

Calendar details

Date:	**Tuesday, August 24, 2021**
Time:	9:00 to 10:30 AM (Melbourne, Australia)
Event Registration Link:	https://www.eventbrite.com.au/e/australian-society-of-rheology-seminar-24-august-2021-registration-164411979657

Invited lecture

Prof Michael Solomon

(Macromolecular Science and Engineering, University of Michigan)

Presentation Title: Rheology of colloidal gels with embedded active matter

Abstract: The introduction of strong, short-range attractions between colloidal particles results in the formation of open, space-filling structures – colloidal gels – that have useful mechanical properties, such as elasticity and a yield stress. Colloidal gelation is important for a broad range of materials applications in the consumer, agricultural, and pharmaceutical industries because such gels are one of the few ways to induce weak elasticity in complex fluid formulations. In all these cases, the local microscopic dynamics of the gel network is the principal determinant of the suspension's mechanics and rheology. Here we address ways to control the rheology of colloidal gels by embedding active matter into gel networks. We investigate dilute gels with fractal cluster microstructure. The active colloids are Janus particles, which can be activated through addition of hydrogen peroxide. This fuel that drives self-diffusiophoretic motion of the active colloids. We characterize the microdynamics and rheology of the gel network as a function of the hydrogen peroxide concentration. The microdynamics of the gels are significantly enhanced, both locally and globally, by the introduction of the active matter. We furthermore find that the enhanced in gel dynamics are strongly correlated with changes in the elastic modulus and yield stress of the gel network. Our results demonstrate how the mechanical properties of gel networks can be autonomously tuned by varying the number and activity of embedded Janus particles. Through addition and depletion of the active component, we can create gels with multi-state mechanical properties, a function potentially useful in a number of industry sectors.

Speaker's biography

Mike Solomon is Professor of Chemical Engineering at the University of Michigan. He received his Ph.D. at the University of California at Berkeley in 1996. After a post-doctoral appointment at the University of Melbourne, Australia, he joined the faculty at the University of Michigan. His group's research interests are in gel rheology, colloidal assembly, and the biomechanics of bacterial biofilms. He was 2011 recipient of the Soft Matter Lectureship, awarded by The Royal Society of Chemistry's journal Soft Matter; he is a AAAS (2016) and APS Fellow (2017). He is currently Dean of Rackham Graduate School and Vice Provost for Academic Affairs – Graduate Studies.

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