

## MMEC SEMINAR SERIES

### MECHANICS: MODELLING, EXPERIMENTATION, COMPUTATION

Tuesdays @ 4:00pm – Room 3-370

April 1, 2014

# Large Amplitude Oscillatory Shear Flows for a Model of a Thixotropic Yield Stress Fluid

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Simple models of yield stress fluids such as the Bingham model fail to capture complex yield stress phenomena such as yield stress hysteresis, delayed yielding and thixotropy. It turns out that such phenomena can be described by a viscoelastic model in the limit where the relaxation time is large. Specifically, the PEC model of Larson can capture the essential aspects of thixotropic yield stress behavior. We discuss the behavior of the model under an imposed periodic shear force. We identify regimes of fast, slow and yielded dynamics and discuss the overall behavior of the system in dependence of amplitude and frequency. The resulting flows are analyzed by asymptotic methods.

The scale of the period of the oscillation relative to the times over which yielding and unyielding occur has a crucial influence on the qualitative dynamics. It takes longer for the fluid to unyield than it takes to yield. As a result, there is a range of frequencies and amplitudes where the fluid remains in a yielded state or unyields only partially. It is also possible for yielded and unyielded flows to coexist at the same stress amplitude. This behavior leads to shear bands in strain controlled situations.

*Seminar Host: Kostya Turitsyn (turitsyn@mit.edu)*

*Please join us for refreshments beforehand, outside Room 3-370*

*For more information, visit our website at <http://web.mit.edu/mmec/>*

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