The Society of Rheology 89th Annual Meeting – *Denver, Colorado*

Program Updates

- **Paper CR1** [Monday, 9:50, Aspen (Track 6)] is replaced by:

  Numerical simulation of granular collapses using μ(I) rheology
  Stéphanie Riber, Romain Castellani, Hachem Elie, and Rudy Valette
  CEMEF, MINES ParisTech, PSL Research University, Sophia Antipolis, PACA 06904, France

  In many domains such as geophysics or metallurgy, predicting the behavior of granular materials is a key subject to better understand observed phenomena or perform processes optimization. However, such predictions can be tricky as the physics underlying granular media flows are still subject to discussion. One way to deal with this topic relies on discrete simulation that can be very costly. A continuous approach is however possible using μ(I) rheology.

  We implemented such model using finite element method and solving momentum and mass conservation equations. A benchmark test case based on the collapse of a granular column was used. Results have shown the same behavior as described in the experimental literature by (Lajeunesse et al.) and (Lube et al.), which is a dependence of relative spreading to the initial aspect ratio 'a' of the columns: linear dependence for small ones and following a power-law for large 'a'. However, we also demonstrate that material parameters such as friction coefficient for the grains play a quantitative role in the spreading. An additional length scale such as columns height (or its ratio compared to grain sizes) can also change spreading kinetics at a given (large) 'a'. Finally, our simulations using μ(I) rheology also give additional insights on how the flow is distributed inside the columns, depending on their initial aspect ratio, and how this later parameter translates in terms of energy dissipation repartition.

  Keywords: granular materials, μ(I) rheology, numerical simulations, dam break

- **Paper SC12** [Monday, 4:35, Crystal C (Track 3)] will be presented by *G. Colombo*.
- **Paper SM14** [Tuesday, 9:50, Crystal B (Track 2)] was cancelled.
- **Paper SM15** [Tuesday, 10:15, Crystal B (Track 2)] is replaced by:

  Rheology and nanorheology of entangled melts of non-concatenated ring polymers
  Ting Ge[1], Sergey Panyukov[2], Gary S. Grest[3], and Michael Rubinstein[1]
  [1]Department of Chemistry, University of North Carolina, Chapel Hill, NC 27599; [2]P. N. Lebedev Physics Institute, Russian Academy of Sciences, Moscow 117924, Russia; [3]Sandia National Laboratories, Albuquerque, NM 87185

  An entangled melt of non-concatenated ring polymers exhibits self-similar dynamics, yielding a distinctive power-law stress relaxation. We develop a scaling model to describe the conformations and dynamics of non-concatenated ring polymers. The conformation of a non-concatenated ring polymer under topological constraints is described as a fractal loopy globule (FLG) with fractal dimension $d_f=3$, in which loops at different length scales overlap with each other in a self-similar manner with the Kavassalis-Noolandi overlap parameter $O_{KN}=10$-20. The self-similar dynamics of rings as FLGs occurs by complete tube dilation, which means that the average spacing between topological constraints relevant to the dynamics increases with time and is comparable to the characteristic size of a rearranged loop. Various dynamic scaling exponents predicted by the FLG model are consistent with recent computer simulations and experiments. We further use molecular simulations to probe local viscoelasticity of an entangled melt of non-concatenated ring polymers by tracking the motion of embedded non-sticky nanoparticles (NPs). As in conventional microrheology, the generalized Stokes-Einstein relation is employed to extract an effective stress relaxation function $G_{GSE}(t)$ from the mean square displacement of NPs. $G_{GSE}(t)$ for different NP diameters d are compared with the stress relaxation function G(t) of a pure polymer melt. The deviation of $G_{GSE}(t)$ from G(t) reflects the incomplete coupling between NPs and the dynamic modes of the melt. As d increases towards the spanning size R of ring polymers, $G_{GSE}(t)$ approaches G(t) of ring melt with no entanglement plateau.

- **Paper MM15** [Tuesday, 4:10, Aspen (Track 6)] will be presented by *F. Scheffold*.
- **Paper SG5** [Wednesday, 9:50, Aspen (Track 6)] was cancelled.
- **Paper SC26** [Wednesday, 11:30, Crystal C (Track 3)] will be presented by *J. Maia*.
- **Paper BB6** (*Fuller*) [Wednesday, 1:30, Crystal A (Track 1)] and **Paper BB13** (*Vermant*) [Wednesday, 5:00, Crystal A (Track 1)] switch presentation time.
- **Paper SG15** [Wednesday, 4:10, Aspen (Track 6)] is replaced by **Paper PO88**, which will also be presented in the Poster Session.
- **Paper SM39** [Wednesday, 5:00, Crystal B (Track 2)] was cancelled.
- **Paper PO28** [Wednesday, 6:30, Cripple Creek Ballroom (Poster Session)] was cancelled.
- **Paper NF35** [Thursday, 8:40, Crestone B (Track 5)] will be presented by *R. Seto*.
- **Paper SM41** [Thursday, 9:05, Crystal B (Track 2)] will be presented by *B. Wu*.