Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

The dynamics of semiflexible actin filaments in simple shear flow[1]

YANAN LIU, ANKE LINDNER, OLIVIA DU ROURE, PMMH, ESPCI, Paris —

The rheological properties of complex fluids made of particles in a suspended fluid depend on the behavior of microscopic particles in flow. A first step to understand this link is to investigate the individual particle dynamics in simple shear flows. A rigid rod will perform so-called Jeffery orbits, however when the rod becomes flexible and Brownian, the behavior in terms of deformation and migration is still to be fully understood. We chose here to address this situation by studying experimentally the behavior of semiflexible polymers. We use actin filaments and combine fluorescent labeling techniques, microfluidic devices to carry out controlled systematical experiments. Different dynamics are observed as a function of the elasto-viscous number, comparing viscous forces to elastic restoring forces $\zeta = (8\pi\eta\dot{\gamma}L^4)/(Lpk_BT)$. The bending modulus of the actin filaments is given by its persistence length $Lp = 17 \pm 1\mu m$. When increasing the elasto-visous number we subsequently observe tumbling, buckling, and bending under flow. Those observations seem to be in good agreement with recent numerical simulations. At the same time, actin filaments fluctuate due to Brownian motion and these fluctuations can modify the individual dynamics of actin filaments.

[1]ERC PaDy No.682367

Yanan LIU
PMMH, ESPCI, Paris

Date submitted: 29 Jul 2016 Electronic form version 1.4