Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Effect of Mg Ions on Microrheological Properties of F-actin Solution across Isotropic-Nematic Phase Transition[1] JUN HE, MICHAEL MAK, YIFENG LIU, JAY TANG, Brown University — We studied microrheological properties of F-actin across the isotropic-nematic phase transition region by video particle tracking and laser deflection particle tracking methods. The two methods give consistent results. As the nematic order parameter increases with the actin concentration, G'_x (along the alignment) and G'_y grow apart, with G'_y larger than G'_x. The moduli scale with actin concentration as $G'_x \propto c^{0.54\pm0.13}$ and $G'_y \propto c^{1.38\pm0.15}$. Furthermore, G' and G'' dependence on $[Mg^{2+}]$ were measured and compared for 1 mg/ml isotropic and 4 mg/ml nematic F-actin solutions. For isotropic phase, G' increase with $[Mg^{2+}]$ up to 6 mM and then plateaus; for nematic phase, G'_y is larger and both G'_x and G'_y increase with $[Mg^{2+}]$ monotonically all the way up to 16 mM, above which F-actin bundle formation occurs. In both isotropic and nematic phases, G'' only weakly depends on $[Mg^{2+}]$. In conclusion, particle tracking microrheology reveals rich rheological features of F-actin affected by I-N phase transition and by tuning weak electrostatic interactions among the filaments.

[1]Supported by NSF (DMR0405156) and PRF (42835-AC7).

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Date submitted: 23 Nov 2007 Electronic form version 1.4