Solid or Liquid? – Kinetically induced solidification in a simple nanoconfined liquid

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In particular, we studied OMCTS confined between a flat silicon surface and a silicon tip and found that at very low approach speeds (\( \leq 0.3 \, \text{Å/sec} \)) the confined fluid remains liquid-like with no change in mechanical relaxation time from the bulk, although ordering is observed in the stiffness and damping of the film. However, when approaching the tip slightly faster at or above 6 Å/sec, the liquid suddenly changes properties dramatically. In the ordered regime, damping is greatly reduced and the mechanical relaxation times show large peaks, indicating an elastic, solid-like response. This result suggests that the observed solidification is a non-equilibrium effect induced at very long time scales.

\(^1\)Funding is acknowledged from NSF-MRI and NSF-CAREER

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Date submitted: 01 Dec 2005