Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Reversible Rupture of a Two-Dimensional Alkane Crystal[1]
SHISHIR PRASAD, ALI DHINOJWALA, The University of Akron — We present the first study of the rupture of a surface frozen monolayer of alkane (nonadecane) by oscillating an air bubble in its disordered melt. The two-dimensional (2D) crystal breaks abruptly at the start of every expansion and contraction cycle and recovers rapidly back to its original structure in a fraction of a second. This is unlike our experience of watching glass sheets or solids break due to the fast recovery times after the rupture of 2D crystals. The strength of this 2D crystal is determined by the presence of defects or grain boundaries and it is a strong function of temperature and rate of change in (surface) area. These results have important consequences in understanding the role of defect-mediated mechanical properties in crystals, colloids, glasses, granular materials, and fluids in confined geometries.

[1]Financial Support of NSF-DMR 0512156 and PRF

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Date submitted: 27 Nov 2005 Electronic form version 1.4