

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Plasticity, defect dynamics and superfluid phenomena in deformed solid ^4He ¹ DEBABRATA SINHA, SURAJIT SENGUPTA, TIFR Centre for Interdisciplinary Sciences, CHANDAN DASGUPTA, Department of Physics, Indian Institute of Science, ORIOL VALLS, School of Physics and Astronomy, University of Minnesota — We present a numerical study of a continuum plasticity field coupled to a Ginzburg-Landau model for superfluidity. The results suggest that a supersolid fraction may appear as a long-lived transient during the time evolution of the plasticity field at higher temperatures where both dislocation climb and glide are allowed. Supersolidity, however, vanishes with annealing. As the temperature is decreased, dislocation climb is arrested and any residual supersolidity due to incomplete annealing remains frozen. We show that superfluid response will be experimentally observable only if certain mechanical and structural conditions are satisfied. Study of the superfluid phenomena in solid ^4He in the presence of a dynamic defect density gives rise to many interesting observations and may provide a resolution to some of the perplexing issues concerning a variety of experiments on bulk solid ^4He .

¹Indo-US Science and Technology Forum grant is gratefully acknowledged

Debabrata Sinha
TIFR Centre for Interdisciplinary Sciences

Date submitted: 15 Nov 2013

Electronic form version 1.4