Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Shear modulus of solid ^{3}He in the bcc and hcp phases[1] JOHN BEAMISH, ZHIGANG CHENG, FABIEN SOURIS, University of Alberta — The shear modulus of solid hcp ^{4}He decreases significantly at temperatures above 100 mK [1, 2]. This is due to to dislocations which are localized when pinned by ^{3}He impurities at low temperature but become mobile when ^{3}He impurities "evaporate" at high temperature. The unpinned dislocations move freely in the basal plane of the hcp structure. This produces anisotropic and extraordinarily large softening of the shear elastic constant C_{44}, an effect referred to as "giant plasticity" [2]. Previous measurements [3] on solid ^{3}He showed similar shear modulus changes in the hcp phase but not in the bcc phase. Here, we report new shear modulus measurements in both the bcc and hcp phases.^{3}He. These show a similar shear modulus anomaly in the bcc phase, indicating that dislocation softening is not unique to hcp phase of helium. We compare our results for bcc and hcp ^{3}He to those hcp ^{4}He, and discuss the roles that lattice structure and quantum statistics play in dislocation motion and impurity pinning.

[1] J. Day and J. R. Beamish, Nature 450, 853 (2007).
[2] A. Haziot et al., Phys. Rev. Lett. 110, 035301 (2013). [3] J. T. West et al., Nature Physics 5, 598 (2009).

[1]Research supported by NSERC Canada

John Beamish
University of Alberta

Date submitted: 12 Nov 2014 Electronic form version 1.4