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Non-classical Response and Shear Modulus of Solid 4He[1] D.Y. KIM, S. KWON, H. CHOI, W.S. CHOI, E. KIM, Department of Physics and Center for Supersolid and Quantum Matter Research, KAIST, Daejeon, South Korea, H.C. KIM, National Fusion Research Institute (NFRI), Daejeon, South Korea —
The relation between the nonclassical rotational inertia (NCRI) and the shear modulus increase of solid 4He was investigated. A pair of piezoelectric transducers is positioned in the center of a torsional oscillator to measure the shear modulus. We observe the NCRI and the shear modulus increases below 200mK with similar temperature, measurement drive, and frequency dependence. The drive and frequency dependence in the shear modulus increase can be understood by the model of thermally assisted unpinning of dislocations from impurities. However, the shear modulus increase is found to be insufficient to explain the magnitude of the NCRI. In addition, no linear correlation between the magnitude of the NCRI and the shear modulus increase is found and the magnitude of shear modulus shows a rather negative correlation with that of NCRI.

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