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Torsional oscillators and the entropy dilemma of solid ^{4}He M.J. GRAF, A.V. BALATSKY, I. GRIGORENKO, S.A. TRUGMAN, (LANL), Z. NUSSINOV, (WUSTL) — Solid ^{4}He is viewed as a nearly perfect Debye solid. Yet, recent calorimetry measurements by Chan's group (JLTP **138** (2005) 853 and Nature **449** (2007) 1025) indicate that at low temperatures the specific heat has both cubic and linear contributions. These features appear in the same temperature range where measurements of the torsional oscillator period suggest a supersolid transition. We analyze (Phys. Rev. B **75** (2007) 094201) the specific heat and compare the measured with the estimated entropy for a proposed supersolid transition with 1% superfluid fraction and find that the observed entropy is too small. We suggest that the low-temperature linear term in the specific heat is due to a glassy state that develops at low temperatures and is caused by a distribution of tunneling systems in the crystal. We propose that dislocation related defects produce those tunneling systems. Further, we argue (Phys. Rev. B **76** (2007) 014530) that the reported mass decoupling is consistent with an increase in the oscillator frequency as expected for a glass-like transition. The glass model offers an alternate interpretation of the torsional oscillator experiments in contrast to the supersolid nonclassical rotational inertia (NCRI) scenario.

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