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Heat capacity reveals a possible glass state in hcp ^4He solids
JUNG-JUNG SU, MATTHIAS J. GRAF, Theoretical Division, Los Alamos National Laboratory, ALEXANDER V. BALATSKY, Theoretical Division, Los Alamos National Laboratory, Center for Integrated Nanotechnology, Los Alamos National Laboratory — We model the low-temperature specific heat of solid ^4He by invoking two-level tunneling states in addition to the usual phonon contribution of a Debye crystal for temperatures far below the Debye temperature, $T < \Theta_D/50$. By introducing a cutoff energy in the two-level tunneling density of states, we can describe the excess specific heat observed in solid hcp ^4He , as well as the low-temperature linear term in the specific heat. Agreement is found with recent measurements of the temperature behavior of both specific heat and pressure. These results suggest the presence of a small fraction, at the parts-per-million(ppm) order, of two-level tunneling systems in solid ^4He , irrespective of a possible existence of supersolidity.

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