

Onset Properties of Supersolid Helium

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Abstract

Supersolid helium has a rather low transition temperature and a small critical velocity, compared with liquid helium. These properties could be explained in terms of helium's spectrum structure and quantum jumps involving large momentum transfer. A grain in the solid helium possesses valleys (local minima) in its many-body dispersion curve (the lowest eigenenergies of the system as a function of given momenta), and an exchange of large momenta with the grain's surroundings occurs in a jump between a level in one valley and another level in the neighboring valley. Such jump process also naturally causes dissipation accompanying the onset of supersolidity.