

Abstract Submitted  
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**Supersolid is Dirty**<sup>1</sup> JIANSHENG WU, PHILIP PHILLIPS, University of Illinois — A microscopic model for the supersolid phase in  $^4\text{He}$  is given. On the grain boundary, the motion of atoms is well described by a disordered Bose-Hubbard model. We argue that the clean system is a commensurate Mott insulator but in the presence of disorder, a supersolid state obtains. At work is the disorder-induced closing of the Mott gap. We find that the transition temperature to the supersolid state is an increasing function of disorder as is seen experimentally. In addition, we are able to explain the saturation of the superfluid fraction below a characteristic temperature and the pressure dependence of the superfluid fraction. Finally, we also find that a glassy Bose metal phase (BM) is possible and possesses a period shift, though it lacks superflow. This latter observation is useful in explaining the period shift without superflow in hydrogen.

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