Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

On the Supersolid State of Matter BORIS SVISTUNOV, University of Massachusetts, NIKOLAY PROKOF'EV, University of Massachusetts — We prove that the necessary condition for a solid to be also a superfluid is to have zero-point vacancies, or interstitial atoms, or both, as an integral part of the ground state. As a consequence, superfluidity is not possible in commensurate solids which break continuous translation symmetry. We discuss recent experiment by Kim and Chan [Nature, **427**, 225 (2004)] in the context of this theorem, question its bulk supersolid interpretation, and offer an alternative explanation in terms of superfluid helium interfaces.

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Date submitted: 29 Nov 2004 Electronic form version 1.4