

From disordered crystal to glass - Exact theory

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We calculate thermodynamic properties of a disordered model insulator, starting from the ideal simple-cubic lattice ($g = 0$) and increasing the disorder parameter g to $\gg 1/2$. As in the earlier Einstein and Debye approximations, the ground state energy is discontinuous at $g_c = 1/2$. For $g < g_c$, the low-T heat-capacity $C \propto T^3$, whereas for $g > g_c$, $C \propto T$. The van Hove singularities disappear at any finite magnitude g of the disorder. For $g > 1/2$ we discover novel fixed points in the self-energy and spectral density of this model glass. © 2001 Elsevier Science B.V. All rights reserved.