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Thermodynamic properties of inhomogeneous superconductors near their transition temperature SRINIVAS RAGHU, REZA JAMEI, STEVEN KIVELSON, Stanford University — Recently, scanning tunneling spectroscopy (STS) experiments have revealed suggestive evidence of the existence of superconducting gap inhomogeneities at low temperatures in some families of cuprate materials. The consequences of such inhomogeneity near the superconducting transition, however, remain an important and unresolved issue. Here, we study the effect of intrinsic gap inhomogeneities on the mean-field electronic specific heat (and other thermodynamic properties) in the vicinity of the superconducting transition. We consider a spatially-varying pairing interaction in a d-wave BCS model, solve the mean-field equations self-consistently for the magnitude of the gap function, and determine the thermodynamic properties of the system. As T approaches Tc, the coherence length grows, causing the system to become effectively more homogeneous due to self-averaging; we explore the extent to which various types of inhomogeneity remain important or get washed out near Tc.

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