

[tex44] Latent heat and heat capacities at superconducting transition

The coexistence line between the normal and superconducting phases of some metallic material is observed to be well approximated by the empirical formula,

$$H_{coex}(T) = H_0(1 - T^2/T_c^2), \quad 0 \leq T \leq T_c,$$

where H_0, T_c are constants.

(a) Use the Clausius-Clapeyron equation adapted to this situation (see [tln35]) to calculate the latent heat L (per unit volume) at the transition. Plot L versus T for $0 \leq T \leq T_c$.

(b) When the material is heated up along the coexistence line, different specific heats obtain for the two phases. Use the results of (a) to calculate the discontinuity $\Delta C = C^{(nc)} - C^{(sc)}$ (per unit volume) across the coexistence line. Plot ΔC versus T for $0 \leq T \leq T_c$.

Solution: