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Low-temperature specific heat and thermal Hall conductivity in a vortex state of d-wave superconductors ASHOT MELIKYAN, Materials Science Division, Argonne National Laboratory, OSKAR VAFEK, Florida State University and National High Magnetic Field Laboratory — We analyze the mixed state of d-wave lattice superconductors focusing on the quasiparticle contribution to the specific heat and the thermal Hall conductivity at intermediate magnetic fields $H_{c1} \ll H \ll H_{c2}$. In the ultra-low temperature regime $T \ll T_0 \approx v_D^2/(v_F l)$ the specific heat follows a general scaling form $C[T, H = hc/el^2] = (T/v_F l)\Phi[v_F/(Tl), v_F/v_D, k_F l]$. In this regime the specific heat exhibits oscillatory behavior as a 2π-periodic function of $k_F l$: in general it has an activated form $C \propto \exp(-\Delta_m/T)$ except for a discrete set of $k_F l$ where $\Delta_m = 0$ and $C \propto T^2$. At temperatures $T_0 \ll T \ll \Delta$, the $k_F l$-oscillations become unobservable due to thermal broadening and the Simon-Lee scaling is recovered. The results of the analysis of the thermal Hall conductivity are similar: in particular, at the lowest temperatures, κ_{xy} is an oscillating 2π-periodic function of $k_F l$. We calculate the scaling functions numerically and compare our results with the existing experimental data on the specific heat and thermal Hall conductivity.

Ashot Melikyan
Materials Science Division, Argonne National Laboratory

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