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Large Thermal Fluctuation effects on Vortex Matter in Iron Arsenide Superconductors $Ca_{10}(Pt_3As_8)(Fe_2As_2)_5$ and $Ca_{10}(Pt_4As_8)(Fe_2As_2)_5$ OSCAR AYALA-VALENZUELA, JEEHOON KIM, LAONARDO CIVALE, Los Alamos National Laboratory, MPA-CMMS TEAM — At finite temperatures, thermal fluctuations (TF) may allow vortices in a superconductor to jump from one pinning center to another in response to the driving force of the current, even if the current density is lower than the critical current density (J_c). This effect, known as flux creep, is orders of magnitude larger in cuprate HTS than in conventional low critical temperature (T_c) materials, mainly due to the much smaller coherence length and large anisotropy. TF in cuprates also produce melting of the vortex lattice and the appearance of vortex liquid phases (VLP), characterized by J_c =0, near T_c. In general iron-based superconductors (FeSC) also exhibit large vortex fluctuation effects, with creep rates as large as or even larger than cuprates, in spite of the lower T_c. VLP are observed in many of FeSC; their extension and characteristics are topics of extensive current research. We have explored vortex fluctuation effects in single-crystals of the novel FeSC $Ca_{10}(Pt_3As_8)(Fe_2As_2)_5$ and $Ca_{10}(Pt_4As_8)(Fe_2As_2)_5$ by measuring the magnetization and its time decay in a SQUID magnetometer. We found creep rates even higher than in YBCO. We also observed extensive VLP (characterized by a reversible magnetization) that cover most of the mixed state region in the H-T phase diagram, as well as superconducting fluctuations above T_c. These unusually strong fluctuations are a consequence of the very large penetration depth λ, which results in Ginzburg numbers (G_i) higher than in cuprates.

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