

Abstract Submitted
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Evidence for Hexatic Bose Glass in the Mixed Phase of Type-II Superconductors with Material Line Defects¹ JOSE P. RODRIGUEZ, Physics & Astronomy, California State University at Los Angeles, CHARLES E. CREFFIELD, Fisica de Materiales, Universidad Complutense de Madrid — Dislocation lines and nano-rod inclusions in thin films of $\text{YBa}_2\text{Cu}_3\text{O}_y$ aligned parallel to the c-axis are known to significantly enhance the critical current in external magnetic field that is also aligned in parallel. In contrast to correlated pinning centers created by irradiation, the former material line defects notably arrange themselves in a “liquid” fashion that shows no clusters or voids. Theoretical calculations predict the existence of a hexatic Bose glass at low temperature in such case[1]. We test that prediction by performing Monte-Carlo simulations of the corresponding two-dimensional Coulomb gas ensemble with close to 3000 vortices. In the regime of weak (“liquid”) pinning centers, we find a 2D hexatic vortex liquid at non-zero temperature characterized by isolated edge dislocations. It freezes into a phase-coherent hexatic vortex glass in the zero-temperature limit in accordance with theory [1].
[1] J.P. Rodriguez, Phys. Rev. B **72**, 214503 (2005); Phys. Rev. B **70**, 224507 (2004).

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