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Vortex Transport in Thickness-Modulated Granular Aluminum Films[1] AUGUST DEMANN, SARA MUELLER[2], STUART FIELD, Colorado State University, YAOHUA LIU[3], DANIEL REICH, The Johns Hopkins University — The nature of superconducting vortices driven in a periodic potential has been the subject of much recent theoretical and experimental interest. We report here the results of transport studies of vortex dynamics in a periodic potential fabricated using a novel technique; this technique yields exceptionally smooth, nearly sinusoidal potentials that are ideal for the investigation of both static and dynamics vortex configurations. Our method starts with a glass substrate into which a periodic square-wave grating is fabricated by electron-beam lithography followed by a subsequent wet etch. The period of the gratings is ≈ 2 μm. A subsequent annealing step at 650 °C smooths the grating into a sinusoidal profile. Finally, a low-pinning granular aluminum film, with $T_c \approx 1.7$ K, is evaporated onto this substrate at an angle with respect to the normal, leading to a superconducting film that also has a sinusoidal modulation in its thickness. We have performed experiments comparing the transport properties of these modulated films to flat films grown at the same time; the modulated films show clear signatures of an increased critical current and effects due to matching and commensurability.

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