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Magnetic Force Microscopy of Superconducting Vortices in Ordered Arrays of Artificial Pinning Centers JOEL KEAY, PRESTON R. LARSON, KEVIN L. HOBBS, MATTHEW B. JOHNSON, University of Oklahoma, OPHIR M. AUSLAENDER, KATHRYN A. MOLER, Stanford University — Ordered arrays of artificial pinning centers were fabricated in Nb thin films using anodic aluminum oxide (AAO) as a template. The nanohole arrays show only a small decrease in the superconducting transition temperature, $T_c \simeq 7.1$ K, from comparable, unprocessed Nb thin films. These artificial pinning arrays have a triangular lattice parameter of 105 nm and antidot diameters of about 50 nm. Anomalous features at the first, second and third matching fields (matching field = 2170 Oe) were observed in the magnetization half-loops of these arrays at 5 K. Magnetic Force Microscopy (MFM) was used to image the nanohole arrays above and below T_c. The images clearly show the nanohole lattice. Individual vortices have also been imaged and their movement within the lattice is being investigated. Preliminary measurements of the depinning force of individual vortices at low fields will be presented. This work was supported by NSF grant nos. DMR-0080054 and NSF-0132534.

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