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Metastable Vortex Lattice Phases in MgB_2 C. RASTOVSKI, K. SCHLESINGER, P. DAS, M.R. ESKILDSEN, University of Notre Dame, IN, US, L. DEBEER-SCHMITT, Oak Ridge National Laboratory, TN, USA, N. ZHIGADLO, J. KARPINSKI, ETH Zurich, Switzerland — We present small-angle neutron scattering (SANS) studies of vortex lattice (VL) metastability in MgB_2. Three different VL phases are observed, all of which have a triangular symmetry. At low fields the VL is aligned with the crystalline a-axis. At intermediate fields the VL rotates away from the a-axis, leading to two degenerate domain orientations. Once the rotation reaches 30° a single domain, high field VL is reformed, now aligned along the a^*-axis. Metastable configurations are obtained when crossing the equilibrium VL transition lines by cooling or heating in a constant field. At any given field and temperature the equilibrium VL can be obtained by inducing vortex motion. We have explored the details of how the metastable VL transitions to the ground state, and established that the equilibrium VL phase propagate from the edge of the sample towards the center as the magnetic field is reduced. We have successfully prepared samples with a coexistence of metastable and ground state VL domains, and explored how large field changes are necessary to completely suppress the metastable VL phase. The SANS results are compared to measurements of the critical current obtained from magnetization measurements. This work was supported by DOE BES award no. DE-SC0005051.

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