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Anomalous behavior of the critical current in superconducting MoGe nanowires exposed to high magnetic fields. A. ROGACHEV, T.-C. WEI, D. PEKKER, A.T. BOLLINGER, P.M. GOLDBART, A. BEZRYADIN, University of Illinois at Urbana-Champaign — At low temperatures the critical current of superconducting MoGe nanowires with diameters 6-10 nm shows an unusual initial growth with increasing magnetic field, and reaches a maximum at the field 3-5 T. The non-monotonic behavior is present both in parallel and perpendicular field orientations and disappears at high temperatures. We suggest that the effect is caused by magnetic impurities, which suppress superfluid density in the nanowire at low fields but, due to partial polarization in the applied magnetic field, become less efficient pair-breakers in high fields. We compare our data with the microscopic theory that considers this competition of the reduced depairing by localized spins and the increasing depairing by the orbital effects [1]. The theory reproduces all experiential observations and suggests that magnetic impurities reside on a surface of a wire. [1] T.-C. Wei, D. Pekker, A. Rogachev, A. Bezryadin, and P.M. Goldbart, cond-mat/0510476.

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