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Enhancing superconductivity: Magnetic impurities and their quenching by magnetic fields TZU-CHIEH WEI, DAVID PEKKER, ANDREY ROGACHEV, ALEXEY BEZRYADIN, PAUL M. GOLDBART, University of Illinois at Urbana-Champaign — Magnetic fields and magnetic impurities are each known to suppress superconductivity. However, it has recently been found theoretically that in superconducting films with magnetic impurities the critical temperature can be raised by applying a magnetic field (H) [1]. Here, we extend the Eilenberger-Usadel formalism and use it to investigate this interplay of magnetic fields and magnetic impurities. Hence, we are able to compute the critical current (J_c) of a thin superconducting wire, in addition to its critical temperature (T_c). We find three regimes of wire parameters. In one, both T_c and J_c simply decrease with H; in a second, both T_c and J_c first rise and then fall with H; and in a third, T_c simply decreases with H but, at sufficiently low temperatures, J_c first rises and then falls [2]. Our results are consistent with recent experiments on thin superconducting wires [3].
[1] M. Kharitonov and M. Feigel'man JETP Lett. **82**, 473 (2005).
[2] T.-C. Wei et al. cond-mat/0510476.
[3] A. Rogachev et al. (manuscript in preparation).

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