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Thermodynamics of carrier-mediated magnetism in semiconductors[1] A.G. PETUKHOV, South Dakota School of Mines and Technology, Rapid City, L. MAKINISTIAN, South Dakota School of Mines and Technology (on leave from CONICET, FI-UNER, Argentina), S.C. ERWIN, Naval Research Laboratory, R. ABOLFATH, University of Texas Southwestern, I. ZUTIC, SUNY Buffalo — We propose a model of carrier-mediated ferromagnetism in semiconductors that accounts for the temperature dependence of the carriers[2]. The model permits analysis of the thermodynamic stability of competing magnetic states, opening the door to the construction of magnetic phase diagrams. As an example we analyze the stability of a possible reentrant ferromagnetic semiconductor, in which increasing temperature leads to an increased carrier density, such that the enhanced exchange coupling between magnetic impurities results in the onset of ferromagnetism as temperature is raised. We apply this approach to studying thermodynamic fluctuations of magnetization in small systems such as bound magnetic polarons and magnetic nanoislands.

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[2]A. G. Petukhov, I. Zutic, and S. C. Erwin, Phys. Rev. Lett. **99**, 257202 (2007)

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