Ferromagnetic semiconductors as spintronic materials

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The main goal of spintronics is to gain knowledge on spin-dependent phenomena, and to exploit them for new functionalities. TodayŠs research on spintronics involves virtually all material families, the most mature being studies on magnetic metal multilayers, in which spin-dependent scattering and tunneling are being successfully applied in reading heads of high-density hard-discs and in magnetic random access memories (MRAM). However, in the context of spintronics particularly promising are ferromagnetic semiconductors, which combine complementary resources of ferromagnetic and semiconductor material systems.

In the talk, recent progress in semiconductor spintronics will be reviewed emphasizing findings important for either classical or quantum information devices. In particular, the demonstration of isothermal and reversible switching of magnetization by light, electric field and current in diluted ferromagnetic semiconductors, such as (Ga,Mn)As, will be described. The tailoring of domain structures and magnetic anisotropy by strain engineering and confinement will be discussed together with prospects for coherent control of single spins in solid-state environment. Recent progress in search for magnetically doped semiconductors with Curie point above room temperature will be presented.

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