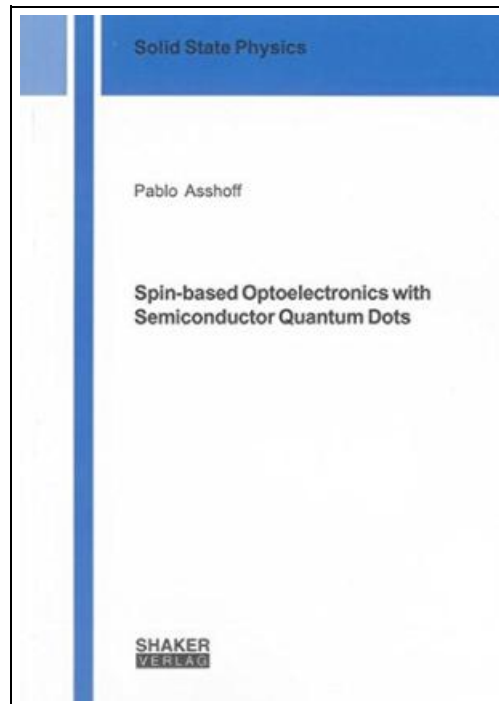


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Shaker Verlag Apr 2012, 2012. Buch. Book Condition: Neu. Neuware - With the serendipitous discovery of what was later recognized to be the electron spin, O. Stern and W. Gerlach in 1922 set the stage for a series of advances in a field that in recent times was termed spin-electronics, or in short spintronics. The electron spin, beyond its relevance for the interpretation of physical phenomena, bears the promise of providing new electronic device concepts. The observation of tunneling magnetoresistance was one of the first major breakthroughs in this regard, followed later by the discovery of the giant magnetoresistance effect, both of which are spin-dependent phenomena that have led to the development of read heads nowadays commonly used in magnetic hard disk drives. In the last years, further new device concepts were conceived to which the electron spin is central. Among them, magnetic racetrack memory, a technology based on spin-torque magnetic domain wall motion, and the all-optical alignment of magnetic domains by the inverse Faraday effect are promising for future applications in the magnetic recording industry. Another prominent spintronic device is the spin-transistor, proposed in 1990, which may outperform conventional semiconductor transistors if developed successfully. What are the challenges ahead for spintronics, as the technology is growing mature, and which fundamental scientific issues are being addressed From a materials science point of view, compounds permitting efficient spin-polarization and spin-transport have to be identified and engineered. Ideally, the materials would be easy to integrate into conventional semiconductor technology. As far as device physics is concerned, real-world prototypes need to prove device concepts feasible. More fundamentally, spin-loss mechanisms during spin-transport must be understood, and the interaction of electron spins with the environment be optimized. Yet a different aspect of spin-based electronics is the implementation of quantum computation schemes. 88 pp. Englisch.

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