Abstract of doctoral thesis

Theory of spin-dependent transport in magnetic solids

David Wagenknecht

Department of Condensed Matter Physics, Faculty of Mathematics and Physics, Charles University

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Theoretical and *ab initio* description of realistic material behavior is complicated and combinations of various scattering mechanisms or temperature effects are often neglected, although experimental samples contain impurities and modern electronics work at finite temperatures. In order to remove these knowledge gaps, the alloy analogy model is worked out in this thesis and implemented within the fully relativistic tight-binding linear-muffin-tin orbital method with the coherent potential approximation. This first-principles framework is shown to be robust and computationally efficient and, consequently, employed to investigate bulk solids and their spintronic applications. Unified effect of phonons, magnons, and alloying gives agreement with literature for temperature-dependent electrical transport (longitudinal and anomalous Hall resistivities) and scattering mechanisms are explained from electronic structures. Moreover, novel data help to identify defects in real samples and experimentally hardly accessible quantities are presented, such as spin polarization of electrical current. Calculated results for both zero and finite temperatures are reliable not only for non-magnetic and magnetic transition metals and random binary alloys but also for half-Heusler ferromagnet NiMnSb and antiferromagnetic CuMnAs. Advantages, limitations, and numerical aspects of introduced approaches are discussed with a focus on further usage for even more complex materials and in basic science.