Galvanomagnetic properties of ordering L_{10}-FePt alloy

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The effect of the long-range order (LRO) on the longitudinal (ϱ[xx], ϱ[zz]) and anomalous Hall (ϱ[xy]) resistivities as well as on the anisotropic magnetoresistance (AMR) in ordering L_{10} -FePt alloys is studied from first-principles. The linear-response theory as formulated in the framework of the relativistic tight-binding linear muffin-tin orbital method which includes both the Fermi-surface and Fermi-sea terms is used. The effect of disorder is treated by means of the coherent potential approximation. The main result is a weak dependence of the anomalous Hall conductivity σ[xy] on the LRO which is, however, compatible with the resistivities ϱ[xx] and ϱ[xy] which both depend strongly on the disorder present in the system. The resistivity and the AMR are predicted to increase with increasing degree of the LRO. We also investigate the effect of spin fluctuations on studied quantities using a simple model of the spin disorder. We have found a good agreement between the theory and recent experiment.