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Anomalous Hall Effect in Heavy Fermion Semiconductors PETER RISEBOROUGH, SUKALPA BASU, Temple University — Using the Kubo formula, the off-diagonal components of the conductivity tensor can be written in terms of completely filled states. This is a restatement of the discovery by Luttinger and Karplus that a (dissipationelss) anomalous Hall conductivity can result from the filled Fermi-volume which is occupied according to the equilibrium Fermi-Dirac distribution function, and has been recently interprted in terms of a Berry Curvature. The condition that the net anomalous conductivity is non-zero, is that time-reversal invariance should be broken and that the system should have low spatial symmetry. The heavy fermion semiconductors, such as $Ce_3Bi_4Pt_3$, are extremely narrow gap semiconductors in which the band-gap is subjected to strong many-body renormalizations at low- temperatures. The electrons in the vicinity of the gap are of mixed f and conduction band character and, therefore are subject to strong spin-orbit scattering, as can also be inferred from the finite low-temperature susceptibility of these compounds. Therefore, when subjected to an external magnetic field, these materials are candidates for showing a finite (dissipationless) intrinsic Hall conductivity of the Luttinger-Karplus type.

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