Intrinsic and extrinsic anomalous Hall effect as investigated by Lorenz number YUKI SHIOMI, University of Tokyo, YOSHINORI ONOSE, YOSHINORI TOKURA — We have investigated thermal and electrical Hall conductivities (κ_{xy}, σ_{xy}) for typical itinerant ferromagnets of Fe, Co, Ni, and their impurity-doped samples to examine the effect of scattering on the intrinsic (Berry-phase-induced) and the extrinsic (skew-scattering-induced) anomalous Hall current (AHC) in terms of the Lorenz number, $L_{xy} = \kappa_{xy}/\sigma_{xy}T$. The L_{xy} coincides with the free electron value (L_0) in the absence of inelastic scattering but it deviates from L_0 if the Hall current is affected by the inelastic scattering. We showed that the Lorenz number for the intrinsic AHC is almost constant and coincides with L_0 at finite temperature, which indicates the scattering-free nature of the intrinsic AHC. On the other hand, that for the extrinsic AHC steeply decreases from L_0 as temperature is increased from $T = 0$. This clearly shows that the extrinsic AHC is certainly dependent on the scattering rate.

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