Effect of randomness on anomalous Hall coefficient in antiferromagnet U_2PdGa_3

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U_2PdGa_3 is an orthorhombic, collinear antiferromagnet with the Néel temperature of T_N = 33 K [1, 2]. However, due to the competition of long-range antiferromagnetism, Kondo effect and randomness the antiferromagnetic state exists only with finite magnetic correlation lengths (below 150 Å) and with lack of discontinuity in the specific heat at the Néel temperature. Furthermore, the dc-magnetic susceptibility displays magnetic history phenomena and Kondo behaviour manifests in electrical resistivity and magnetoresistance properties. In this contribution we present our investigation of carrier scattering mechanism in U_2PdGa_3 by measuring the Hall resistivity. The measurements were performed in the temperature range 2 – 300 K and in magnetic fields up to 7 T. The Hall coefficient R_H is positive, and strongly temperature dependent. At relatively high temperature, the Hall data can be interpreted in terms of skew scattering theory for heavy-fermion systems [3, 4]. We found a large contribution of anomalous Hall coefficient, indicating a dominated contribution of incoherent skew scattering by uranium *5f* moments. Interesting behaviour of the $R_H(T)$ dependence is found at low temperatures. The $R_H(T)$ curve displays a plateau between 11 and 30 K, followed by $R_H(T) \propto lnT$ relation with further decreasing temperature. In other words, the low-temperature Hall resistivity deviates from those predicted by both the conventional theory [5] and by the skew scattering theory [3, 4]. This fact suggests that in addition to the skew and spin-flip scatterings one must take into consideration another scattering mechanism of conduction electrons. In the case of disordered compounds there is possibility of non-zero spin chirality [6], which appears as a result of randomness. We compare the Hall data of U_2PdGa_3 with those observed for strongly correlated electron systems and with those of spin-glasses. In the latter systems the chiral mechanism was reported to play a condiderable role in the Hall effect [7].

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