Mott and Magnetic Criticality in NiS_2

M. Nohara,[1] S. Takashima,[1] N. Takeshita,[2] C. Terakura,[2] and H. Takagi[1,2]

[1]*Department of Advanced Materials, University of Tokyo, Kashiwa 277-8561*
[2]*Correlated Electron Research Center (CERC),*
National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba 305-8562

Electrical resistivity of NiS_2 and $NiS_{1.7}Se_{0.3}$ was measured under high pressure and the electronic phase diagram was determined as shown in Fig. 1. The first order Mott transition line terminates at the critical point (CP) of (P_c, T_c) = (3.4 GPa, 210 K) for the pure NiS_2. The Mott CP was reduced down to (1.5 GPa, 110 K) for Ni $S_{1.7}Se_{0.3}$. The reduction in T_c is most likely due to disorder induced by the Se substitution, while the reduction in P_c is ascribed to the chemical pressure. By applying higher pressure, we approached the magnetic quantum critical point (QCP), at which the antiferromagnetic metallic (AFM) phase vanishes. Resistivity exhibits a $T^{1.5}$ behavior at the QCP for both NiS_2 and $NiS_{1.7}Se_{0.3}$, indicating the criticality of the QCP is insensitive to the disorder.

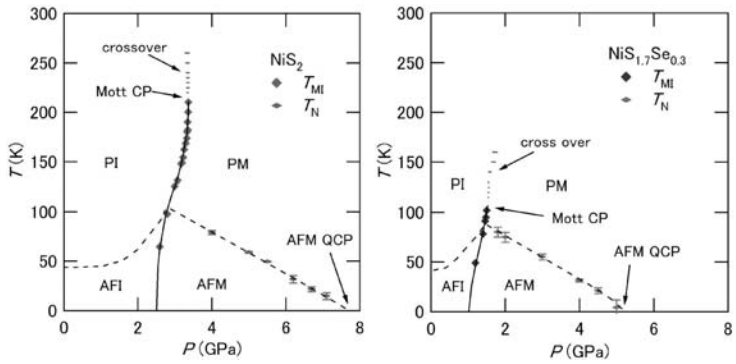

Fig. 1. Electronic phase diagram for NiS_2 and $NiS_{1.7}Se_{0.3}$.