Pressure effect on NiS_2

-Mott critical point and quantum critical point-

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The first order Mott transition is analogous to the gas-liquid transition of molecular fluid, which obeys the Ising universality class near the critical point. This analogy has been confirmed by high pressure study on Cr-doped V_2O_3[1], for which the Mott transition line terminates at the high critical temperature of $T_c \sim 450$ K.

Recently, however, peculiar critical exponents have been reported on the organic Mott system[2]. The relatively low critical temperature of $T_c \sim 40$ K invokes effects of quantum fluctuation on the Mott criticality[3].

In this study, we determined the electronic phase diagram of $NiS_{2-x}Se_x$ as shown in Fig. 1. We found that the Mott critical temperature T_c could be tuned by the Se contents x ; (P_c, T_c) ~ (3.4 GPa, 210 K) for $x = 0$ and (P_c, T_c) ~ (1.5 GPa, 110 K) for $x = 0.3$. The critical temperature T_c for $NiS_{2-x}Se_x$ is in between the T_c for V_2O_3 and the organic system. Thus, we expect that the inspection of critical exponents will elucidate the mechanisms of peculiar Mott criticality of the organic system.

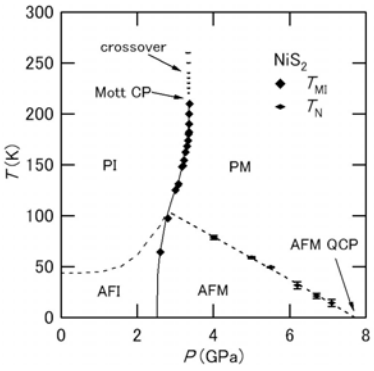

Fig.1 Electronic phase diagram of NiS_2.

[1] P.Limelette *et al*., Science **302**, 89 (2003).
[2] F.Kagawa *et al*., Nature **436**, 534 (2005).
[3] M.Imada *et al*., Phys.Rev.B **72,** 075113 (2006).