Universality Class Of The Mott Transition In EtMe$_3$P[Pd(dmit)$_2$]

Majed Abdel Jawad$^1$, Isao Watanabe$^2$, Naoya Tajima$^3$, Yasuyuki Ishii$^4$, Reizo Kato$^1$

$^1$RIKEN, Saitama, Japan, $^2$RIKEN-RAL, Saitama, Japan, $^3$Toho University, Chiba, Japan, $^4$Tokyo Medical University, Tokyo, Japan

A first-order phase transition ends at a critical endpoint where critical fluctuations are large and dominate the behaviour of physical quantities. It is believed that such behaviours are universal and depend only on 3 parameters. Currently, the universality class of the Mott transition is an unresolved problem [1, 2]. To help resolve this issue, we present isothermal pressure, $P$ measurements of the conductivity, $\sigma$ and the thermoelectric effect within a Helium pressure medium in EtMe$_3$P[Pd(dmit)$_2$], a dimer-Mott insulator. The Seebeck coefficient, $S_b$ is of particular interest as the Mott-transition is clearly seen in this compound (see figure) and helps us to determine the critical pressures of the metallic state in a clear and objective way. Surprisingly, it is found that the metal-insulator limit above the critical end-point is not, as assumed in previous studies [1, 2], at the maximum of $\partial\sigma_T(P)/\partial P$. Scaling of the conductivity and the Seebeck coefficient, on both the insulating and the metallic sides, will be shown. We will also compare the extracted critical exponents from such scaling with those from previous results in other Mott insulators [1, 2, 3].

Figure: Isothermal pressure dependence of the Seebeck coefficient in EtMe$_3$P[Pd(dmit)$_2$] at temperatures ranging from 22 K, up to 60 K.