

Development of Molecular Conductors Based on Metal dmit Complexes

Reizo Kato, A. Tajima, A. Nakao, A. Fukaya, Y. Shimizu, Y. Ishii, T. Yamamoto, Y. Kosaka, J. Eda, H. M. Yamamoto, and M. Tamura

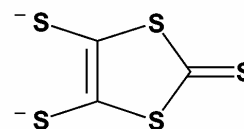
RIKEN, JST-CREST 2-1, Hirosawa, Wako-shi, 351-0198, Japan, e-mail:reizo@riken.jp

Metal-dmit complexes $M(\text{dmit})_2$ ($M=\text{Ni}, \text{Pd}$) have provided a large number of conducting anion radical salts [1]. The electronic state depends on the central metal ion and the counter cation.

Control of the molecular arrangement through the counter cations which enable supramolecular interactions works effectively in the Ni salts. Dihalopyridinium cations form $S\cdots I(\text{Br})$ interactions with the terminal sulfur atom in the dmit ligand and provide a system which has two crystallographically independent $\text{Ni}(\text{dmit})_2$ layers with different molecular arrangements. The one has localized spins and the other has conducting electrons, and they coexist down to 4.2K [2].

On the other hand, the Pd salts provide a strongly correlated two-dimensional system with a quasi triangular lattice formed by $[\text{Pd}(\text{dmit})_2]_2^-$ dimers. Most of them are Mott insulators at ambient pressure. The localized electrons exhibit frustrated paramagnetism. At low temperatures, the spin frustration is removed by various transitions, including antiferromagnetic ordering and spin-singlet pairing (spin gap formation). The Mott insulating state can be suppressed by the application of hydrostatic or uni-axial pressure [3].

Recent development of this unique category of materials will be discussed.



dmit

[1] R. Kato *Chem. Rev.* **2004**, *104*, 5319

[2] Y. Kosaka, H. M. Yamamoto, A. Nakao, M. Tamura, and R. Kato *J. Am. Chem. Soc.* **2007**, *129*, 3054

[3] For example, R. Kato, A. Tajima, A. Nakao, and M. Tamura *J. Am. Chem. Soc.* **2006**, *128*, 10016