Development of Ni(dmit)$_2$ Anion Radical Salts Structurally Controlled by Halogen Bonding

Tetsuro Kusamoto, Hiroshi Yamamoto, Naoya Tajima, Yugo Oshima, and Reizo Kato

RIKEN,
2-1, Hirosawa, Wako-shi, Saitama, 351-0198, Japan,
E-mail: kusamoto@riken.jp

We recently developed a novel magnetic molecular conductor based on Ni(dmit)$_2$ anion radical, (methyl-3,5-diiodopyridinium)[Ni(dmit)$_2$]$_2$, in which supramolecular I···S association between the cations and the anions realized two kinds of layers of Ni(dmit)$_2$ anions: two-dimensional metallic layer and Mott insulating layer. This system is the first example where ONE kind of π-molecule exhibits TWO contrastive properties in a crystal, and can be called ‘Dual functional π-electron system’. Our next target is to expand this system for the development of unique physical properties resulting from the interaction between two types of π-electrons. According to this scenario, we focused on preparation of new Ni(dmit)$_2$ anion radical salts with ethyl-2,5-dihalopyridinium cations. Single crystal XRD studies for these salts revealed that effective halogen···S associations played an important role for the crystal packings. (ethyl-2,5-dibromopyridinium)[Ni(dmit)$_2$]$_2$ and (ethyl-2-iodo-5-bromopyridinium)[Ni(dmit)$_2$]$_2$ were isostructural, forming two kinds of layers of Ni(dmit)$_2$ anions. We will discuss the relationship between crystal structures and physical properties (conductivity, magnetism).

Tetsuro Kusamoto
University Education:
PhD; 2010, The University of Tokyo

Professional Career:
2005-2007: Sony Corp. (Materials Lab.)
2010-present: Postdoctoral Researcher, RIKEN