Highly-Correlated Electron Systems in Organic Radical Crystals

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Solid-state properties of organic radicals have been studied extensively. Among them, heterocyclic thiazyl radicals possess unique chemical and physical properties. They can be regarded as being on the borderline between organic and inorganic materials. They are chemically stable, in contrast to the instability of most organic radicals, and always exhibit 3D crystal structures, formed by π–π interactions, electrostatic interactions and coordinate bonding. Their strong spin-lattice and spin-spin interactions in these 3D lattice lend them their unique physical properties, such as drastic phase transitions, non-linear transport, organic ferromagnetism, and photo-functions [1]. We also report our recent work on the radical anion salts of NDI(naphthalene diimide)-Δ [2]. They crystallize into the so-called gyroid structure, which was previously predicted as a new allotrope structure of 3D carbon by graph theory. We would like to discuss possible research on these highly-correlated electron systems under high-pressure.

[1] For review, see K. Awaga, K. Nomura, H. Kishida, W. Fujita, H. Yoshikawa, M. M. Matsushita, L. Hu, Y. Shuku, and R. Suizu, *Bull. Chem. Soc. Japan.*, **87**, 234 (2014).
[2] A. Mizuno, Y. Shuku, R.Suizu, M. M. Matsushita, M. Tsuchiizu, D. R. Mañeru, F. Illas, V. Robert, K. Awaga, *J. Am. Chem. Soc.*, **137**, 7612 (2015); A. Mizuno, Y. Shuku, M.M. Matsushita, M. Tsuchiizu, Y. Hara, N. Wada, Y. Shimizu, *K. Awaga, *Phys. Rev. Lett.*, **119**, 057201 (2017).