Visiting Professors

Visiting Professor
NAKAMURA, Masakazu *(from Nara Institute of Science and Technology)*

Giant Seebeck Effect in Pure π-Conjugated Molecular Solids

The Seebeck effect is a phenomenon where a voltage appears in a material with temperature gradient. Its origin has been generally understood by the transport coefficients of charge carriers under electric field and temperature gradient where the charge–vibration interaction is included only as 'scattering.' We found that irregularly large Seebeck coefficients appear in thin films of pure π-conjugated molecules, of which magnitude is 100 times larger than the prediction by the conventional theory. A strong charge–vibration coupling is considered to be the driving force of the giant Seebeck effect (GSE). Recently, the GSE was first observed also in single crystals of π-conjugated molecules and was confirmed to vanish by increasing carrier concentration under light irradiation. Experimental and theoretical studies are under progress. The GSE is also interesting from an application point of view because it possibly produces revolutionary simple thermoelectric generators being free from the series connection of hundreds of p- and n-type blocks.

Visiting Professor
TAJIMA, Naoya *(from Toho University)*

Quantum Transport Phenomena in Molecular Massless Dirac Fermion Systems

We have discovered first bulk (multilayered) two-dimensional massless Dirac fermion systems in an organic conductor α-$(BEDT\text{-}TTF)_2I_3$ under pressure. This system shows next to the charge ordered insulating phase on the temperature–pressure phase diagram. Thus, this system provides a testing ground for the investigation of physical phenomena in strongly correlated Dirac particles. In this work, we develop the field effect transistor channeled by this system and then aim at the detection of (fractional) quantum Hall effect and new type of quantum pheneomena.