

Title:

Photoinduced carrier dynamics in organic superconducting system: Previous results and recent progress

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Abstract:

Toward full understanding of high-temperature superconductivity (SC), electronic properties of the normal state in strongly correlated superconductors such as cuprates and organics have been extensively studied. In the cuprates, various measurements have revealed that pseudogap (PG) and/or fluctuating superconductivity (FSC) appeared above the superconducting transition temperature (T_c) and the relation between them has been discussed. In organic superconductors κ -(BEDT-TTF)₂X (X: inorganic anions) whose electronic phase diagram is quite similar to the cuprates if doping is replaced with effective electron correlation (or pressure), it remains unclear whether PG and FSC exist or not because only a few spectroscopic studies have been performed so far.

In the previous studies, polarized time-resolved measurements in organic compounds κ -(BEDT-TTF)₂Cu(NCS)₂ (κ -NCS) and κ -(BEDT-TTF)₂Cu[N(CN)]₂Br (κ -Br), which have different effective electron correlations, were carried out. We found that anisotropic PG responses for the probe appeared at around 80 K for κ -Br and 70 K for κ -NCS, respectively, as temperature decreased. Moreover, the SC response, which is characterized by slow relaxation time, is steeply developed just at $\sim T_c$ in κ -NCS with decreasing temperature, whereas gradually increased from significantly above T_c . The results suggest that FSC emerges in κ -Br but not κ -NCS, indicating that electron correlation can play a critical role for FSC. In the seminar, the rapid cooling effects on the PG response and exploration of FSC in a mixed crystal system will be introduced.