Suppression of Superconductivity by X-ray Induced Disorder in Organic Superconductor κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br

Koichiro Sano[1], Takahiko Sasaki[1,2], Naoki Yoneyma[1,2] and Norio Kobayashi[1]
[1]*Institute for Materials Research, Tohoku University, Sendai 980-8577, Japan*
[2] *Japan Science and Technology Agency, CREST, Tokyo 102-0075, Japan.*
Email: sano.koichiro@imr.tohoku.ac.jp

Recently, it has been reported that the superconducting transition temperature T_c decreases accompanying the increase of the residual resistivity in X-ray irradiated κ-(BEDT-TTF)$_2$Cu(NCS)$_2$ [1]. In the study, disorder is introduced by X-ray irradiation. On the other hand, we reported the effect of X-ray irradiation-induced carrier doping on the *dc* conductivity [2] and optical conductivity [3] of an organic dimer-Mott insulator κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl. We observed a large reduction of the *dc* resistivity and a large enhancement of the Drude part in a low-energy region of the optical conductivity. These results indicate a carrier doping into the Mott insulator [3,4]. The carrier doping introduced by X-ray irradiation also causes a disorder effect which will induce a carrier localization by random potentials as an Anderson transition [5]. It is interesting to investigate the weak random potential effect for the superconductivity in the organic superconductor κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br in comparison with the results in κ-(BEDT-TTF)$_2$Cu(NCS)$_2$. We measured the temperature dependence of the resistivity in the X-ray irradiated κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br which is located nearby the Mott transition. X-ray irradiation was performed by using a tungsten tube with 40kV, 20mA. With increasing irradiation dose, T_c decreases almost linearly. The suppression rate of T_c for irradiation dose is larger than that in κ-(BEDT-TTF)$_2$Cu(NCS)$_2$. We will discuss the disorder effect induced by X-ray irradiation on the superconductivity in the two organic superconductors on the basis of the different anion molecules, which may be altered by the irradiation, and the different strength of the electronic correlation.

[1] J. G. Analytis *et al*. Phys. Rev. Lett. **96** (2006) 177002.
[2] T. Sasaki *et al*., J. Phys. Soc. Jpn. **76** (2007) 123701.
[3] T. Sasaki *et al.*, Phys. Rev. Lett. **101** (2008) 206403.
[4] N. Yoneyama *et al*., in this conference.
[5] T. Sasaki *et a*l., in this conference.