^{13}C-NMR study on κ-(BEDT-TTF)$_4$Hg$_{2.89}$Br$_8$ under pressure

Y.Eto, and A. Kawamoto
Department of Quantum and Condensed Matter Physics Graduate School of Science, Hokkaido University, Kita10 Nishi8,Kita-ku, Sapporo, Hokkaido 060-0810 Japan
Email: yoshihiro@ltphys.sci.hokudai.ac.jp

There are many superconductors in κ-(BEDT-TTF)$_2$ X family and the superconducting and antiferromagnetic insulating phases are neighboring or coexisting at low temperatures. Therefore, these salts are investigated to reveal the relationship between the superconductivity and antiferromagnetism. Carrier doping and applying pressure are ones of the useful methods for this purpose. High-T_C cuprates show the superconductivity by carrier doping and many organic superconductors show the superconductivity by applying pressure. In spite of the difference of category of the materials, cuprates and κ-(BEDT-TTF)$_2$X have the similar properties like that the superconducting and antiferromagnetic phase are neighboring and they have the possibility of *d* wave symmetry of the order parameter. Organic conductor κ-(BEDT-TTF)$_4$Hg$_{2.89}$Br$_8$ shows the superconductive transition at 4.3K at ambient pressure but unlike other κ-(BEDT-TTF)$_2$X salts, the formal charge per molecule is more than +0.5*e* due to hole doping [1]. Therefore, this salt is regarded as the material on which we can investigate the relationship of the cuprates and organic superconductors. From the measurements of the electric conductivity under pressure, it is confirmed that the resistivity shows *T*-linear behavior just above T_C under low pressure and T^2 behavior under high pressure [2]. They suggest that this salt behaves as non-Fermi-liquid (NFL) under low pressure like High-T_C cuprates. Considering that many other κ-(BEDT-TTF)$_2$ X salts show FL behavior just above T_C, it is indicated that this salt is NFL state under low pressure and become FL state by applying pressure.

Magnetic fluctuation is thought as the origin of the NFL state. We measured ^{13}C-NMR by applying an external field with two directions at ambient pressure and found that $(T_1T)^{-1}$ showed Curie-Weiss behavior down to 7K and decreased at lower temperature in both directions. The pressure dependence of the $(T_1T)^{-1}$ at low temperature suggests that the existence of the antiferromagnetic fluctuation just above T_C and this fluctuation is thought as the origin of the NFL state. In addition, gap-like behavior of the antiferromagnetic fluctuation is suppressed and it behaves as FL by applying higher pressure.

[1] R. Li et. al., Chem. Mater., **10** 1521 (1998)
[2] H. Taniguchi et. al., J. Phys. Soc. Jpn., **76** 113709 (2007)