Antiferromagnetic Fluctuation in Organic Superconducotor, κ-$(BEDT\text{-}TTF)_2Cu(NCS)_2$, under Pressure

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Quasi-two-dimensional organic superconductor, κ-$(BEDT\text{-}TTF)_2Cu(NCS)_2$ is thought to show the relationship between superconductivity and anti-ferromagnetism. Organic superconductors are sensitive to pressures. However, there are few systematic studies to show the dependence of physical pressure about this material. Physical pressure has the advantage of being quantitative. The application of pressure in this material has been shown to steeply decrease Tc with the superconductivity suppressed above 0.6 GPa.

Shubnikov-de Haas (SdH) effect under pressure suggests the relationship between T_C and the effective cyclotron mass [1,2]. This result suggests the electron correlation contributes to the superconductivity. However the detail of the correlation is not so clear. NMR is a powerful tool, which can probe the magnetic fluctuation and the local density of state. We measured the ^{13}C-NMR spectrum and T_1 of the κ-$(BEDT\text{-}TTF)_2Cu(NCS)_2$ under pressures. Both of Knight shift and $1/T_1T$ show the temperature independent behavior at low temperature under all pressure, suggesting that κ-$(BEDT\text{-}TTF)_2Cu(NCS)_2$ behaves as a Fermi liquid at low temperature under all pressures. Pressure dependence of Knight shift at low temperature, which corresponds to the local density of state, cannot examined the strong pressure dependence of the effective cyclotron mass. On the other hand, pressure dependence of Korringa factor, calculated from Knight shift and $1/T_1T$, is similar to that of the effective cyclotron mass. These results suggest that anti-ferromagnetic fluctuations contribute to the superconductivity in this material.

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