SDW Phase of $(EDT\text{-}TTF)_2AuBr_2$

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The low temperature phase in $(EDT\text{-}TTF)_2AuBr_2$ was investigated by ^1H NMR and magnetic susceptibility measurement. This salt, which consists of asymmetric donor molecules, is characterized by a quasi-one-dimensional electron band as $(TMTCF)_2X$. In previous studies for powder sample, the SDW phase has been proposed for the ground state of this salt. In the present investigation, the NMR measurement was done for both protonated and deuterated single crystals and the magnetic susceptibility was measured for deuterated one.

In the measurement of the spin lattice relaxation rate T_1^{-1} in ^1H NMR, we have obtained single exponential relaxation curves in all temperature regions for use of single crystal. Two sharp peaks were observed in the temperature dependence of T_1^{-1} for both protonated and deuterated salts. The peak at higher temperature is attributed to the fluctuation of internal magnetic field probably due to the SDW transition. The magnetic susceptibility χ, which is almost temperature independent from the room temperature, shows the gradual increase below this higher peak temperature. We have not observed a clear decrease of $\chi_{//}$ along the spin easy axis in the SDW phase. However, the observed anisotropic temperature dependence for $\chi_{//}$ and $\chi_{\perp}$ is consistent with the occurrence of the SDW phase below this temperature. Second peak temperature of T_1^{-1}, which is denoted as T^*, is associated with the sub-phase transition in the SDW phase, which has been proposed commonly for the incommensurate SDW phase in $(TMTCF)_2X$. As a result, it is concluded that the incommensurate SDW phase due to the nesting of Fermi surface is also stabilized in $(EDT\text{-}TTF)_2AuBr_2$ as $(TMTCF)_2X$. The SDW transition temperature T_{SDW} was determined from the peak temperature as 15K and 19K for h- and d-salts respectively. This indicates the negative chemical pressure effect, which is probably related to the asymmetric donor, in contrast to the case of $(TMTSF)_2X$. The obtained ratios T^*/T_{SDW} 0.37 and 0.43 for h- and d-salts respectively are slightly larger than the common value $T^*/T_{SDW}\sim0.3$ in $(TMTCF)_2X$. This fact suggests that the ratio T^*/T_{SDW} increases deviating from the common value line for fairly larger T_{SDW} value associated with large electron correlation and strong one-dimensionality and the low temperature sub-phase becomes more stable.