

Field Effect on Organic Mott Insulator

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Field effect transistor is not only an electronic device for application use but also a powerful tool for solid state physics. For example, gate-modulated behavior of zero-gap conductors such as graphene is one of the most interesting subjects in recent material research. Another example is the gate-induced enhancement of T_c of superconductivity of highly correlated electron systems such as Nb-doped SrTiO₃, which gives rise to significant insight about the origin of high- T_c superconductivity. Molecular conductor shares many low-dimensional electronic properties such as zero-gap state, charge ordering, Peierls instability, and non-BCS superconductivity with inorganic correlated systems, but precise control of the physical properties of molecular conductors has been long relying on physical and/or chemical pressure that tunes transfer integrals between molecules. For example, enhancement of the transfer integral effectively reduces the electron-electron correlation (U/W) in κ -(BEDT-TTF)₂Cu[N(CN)₂]Cl and in the vicinity of antiferromagnetic insulator to metal transition unconventional superconductivity appears. The band filling control by the field effect is believed to possess similar correlation-reducing effect, but lack of appropriate procedure to fabricate device configuration with molecular conductors has kept researchers away from considering such experiments. Several groups have reported field effect on molecular conductors recently, but the ranges of material and temperature in their measurements are quite limited. In this presentation, we report versatile method for the fabrication of field effect device of molecular conductor and the results of the measurement. (BEDT-TTF = bis(ethylenedithio)tetrathiafulvalene)

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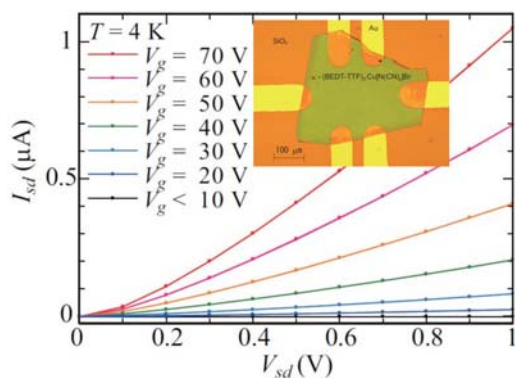


Fig.1 I-V characteristics and microscope image of the device

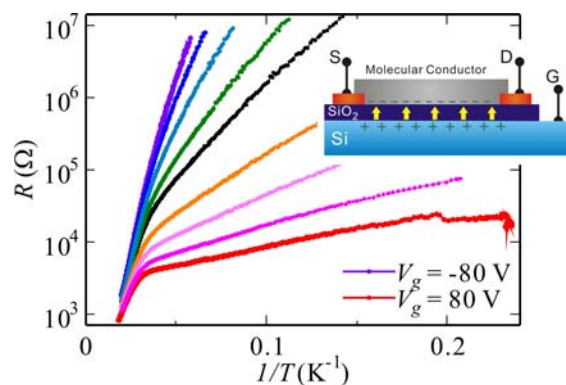


Fig.2 Arrhenius plot of the resistivity and the device configuration