High-density carrier doping into single-crystal C_8-DNBDT under compressive uni-axial strain

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Organic semiconductors (OSCs) are molecular solids in which π-conjugated molecules are weakly assembled *via* van der Waals interactions. With the development of novel organic semiconductor materials and the improvement of solution processing approaches for the growth of high-crystalline organic thin films, carrier mobility of single-crystal OSCs has exceeded 10 $cm^2 \cdot V \cdot s^{-1}$, and OSCs have attracted much attention as the key materials for next-generation organic-besed electronic devices. The electrical conduction of OSCs was conventionally considered to be dominated by hopping transport in which carriers are localized in a single molecule, but for small molecule single crystals, it has been revealed that the wave function of carriers is delocalized and coherent (or band-like) transport has been observed.

Recently, strongly correlated two-dimensional hole gas formation and insulator-metal transition on the surface of small molecule single-crystal OSCs have been observed by band-filling control using ionic liquids based electric double layer transistor (EDLT) [1]. In addition to this, giant piezoresistive effects also have been observed in small molecule single-crystal OSCs by compressing the crystal lattice uniaxially simply *via* bending the flexible devices [2].

In this study, temperature dependence of sheet resistance was measured under compressive uni-axial strain into highly doped single crystal C_8-DNBDT, and an apparent insulator-metal transition was observed.

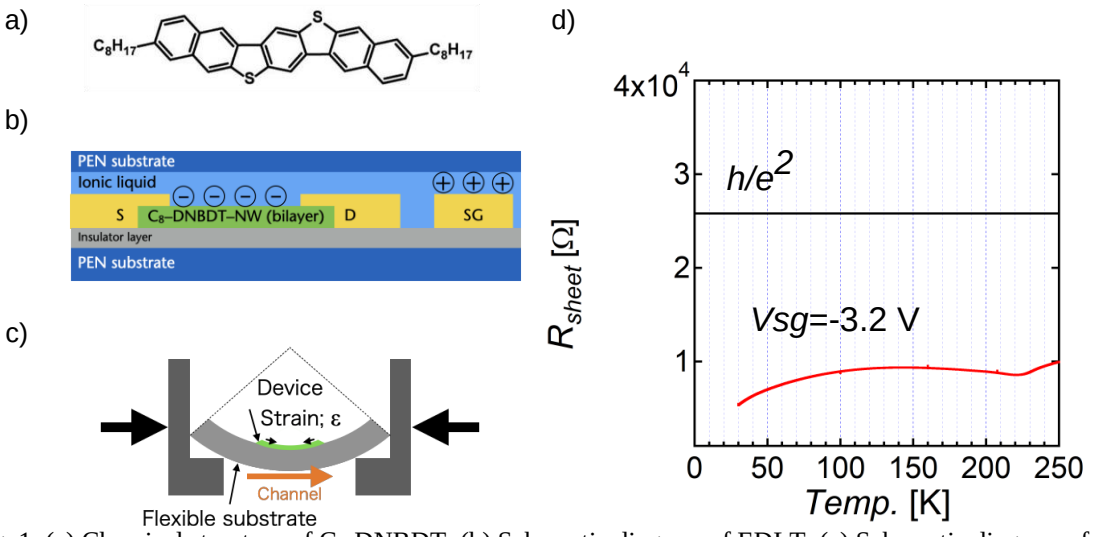

Fig. 1. (a) Chemical structure of C_8-DNBDT, (b) Schematic diagram of EDLT, (c) Schematic diagram of how uniaxial strain is applied, (d) The temperature dependence of sheet resistance R_{sheet}.

References

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[2] T. Kubo, J. Takeya et al., *Nat.Commun.*, **7**, 11156 (2016).