単一 H_2O@C60 分子トランジスタの磁気トンネル伝導特性

Magnetotunneling Properties of H_2O@C60 Single Molecule Transistors

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Endohedral fullerenes, as a class of hybrid molecules formed by encapsulation of metallic species or light molecules inside fullerene cages, exhibit unique properties owing to the presence of encapsulated atoms/molecules and their hybridization via electron transfer. Particularly, the encapsulation of a single H_2O molecule inside a buckyball [1] has attracted widespread attention due to its huge impact on the research of single water molecules. In this work, we have investigated magnetotransport of $H_2O@C_{60}$ single molecule transistors.

As shown in Fig. 1(a), we captured a single $H_2O@C_{60}$ molecule in the gold nanogap electrodes and fabricated a single molecule transistor (SMT) structure [2]. By performing transport measurements, we have obtained a Coulomb stability diagram of a $H_2O@C_{60}$ SMT, as shown in Fig. 1(b) (only the V_{DS}-positive side is shown). As we increased the magnetic field up to B = 15 T, we observed an energy splitting (~1.2 meV) in the ground states, as shown in Fig. (c). Although the origin of the splitting energy is not clear at present, we attribute it to a Zeeman splitting of electrons in the fullerene cage. More detail will be discussed at the conference.

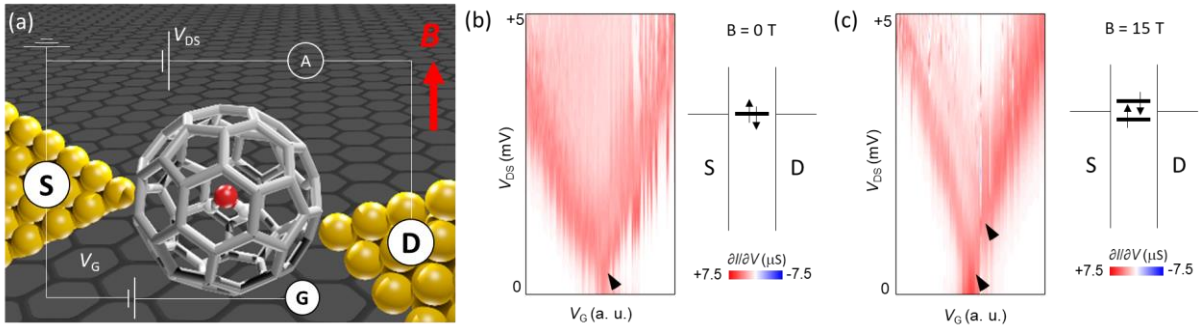

Figure 1 (a) Schematic of a single molecule transistor (SMT). **(b)** Coulomb stability diagram of a single-$H_2O@C_{60}$ SMT at B = 0 T. **(c)** Coulomb stability diagram of a single-$H_2O@C_{60}$ SMT at B = 15 T.

References

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[2] S. Q. Du, et al., The 80th JSAP Autumn Meeting, Hokkaido University, 20a-E308-8 (2019).