

Brief Report

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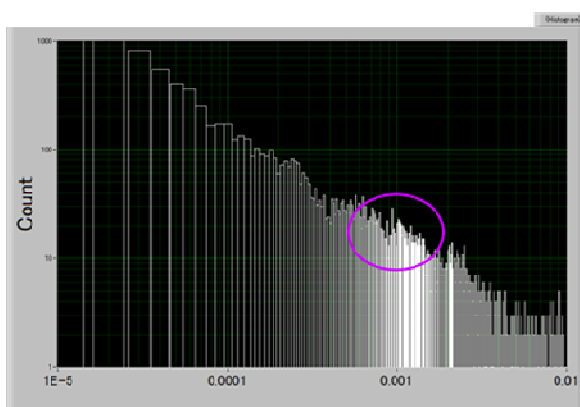
Experiment Work

Part 1: Break Junction Testing

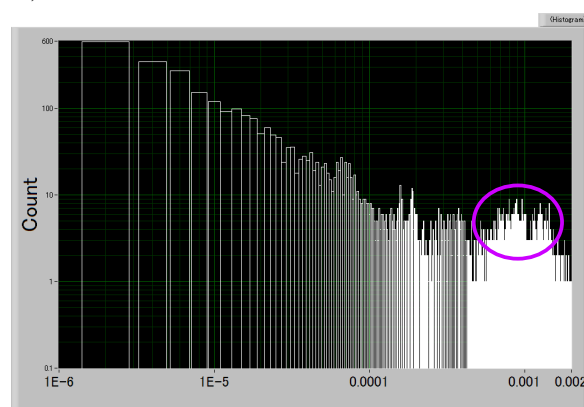
i) Oligothiophene molecules

In the previous report, experiment conducted on 5T-oligothiophene molecule does not show clear presence of conductance peaks even at room temperature. The problem was due to some problem with the pre-amplifier. Thus, the pre-amplifier was changed. By using the new pre-amplifier, the result for 5T-oligothiophene at room temperature can be obtained (as shown below).

RT - Previous result



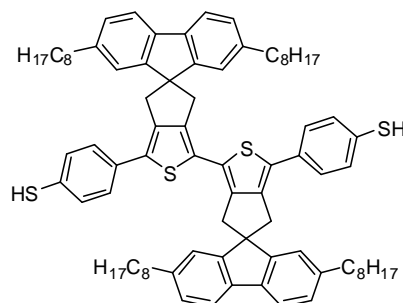
ii) RT – Current result



- Presence of peak at $\sim 1G_0$ region. However, other small peaks can be observed.

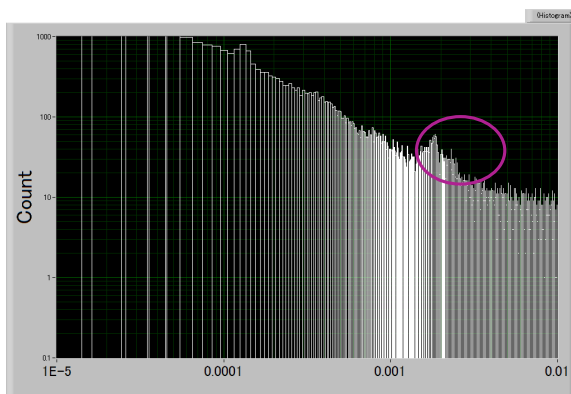
ii) New molecules from Ie-sensei

New molecules were synthesized by Ie-sensei's group. The structure of the simplest molecule, HS-2T-SH is shown as follows.

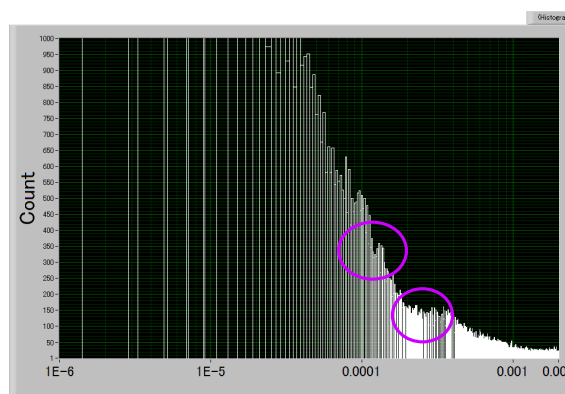


Break-junction testing was performed to determine the conductance of this new molecule and the current results can be seen as follows:

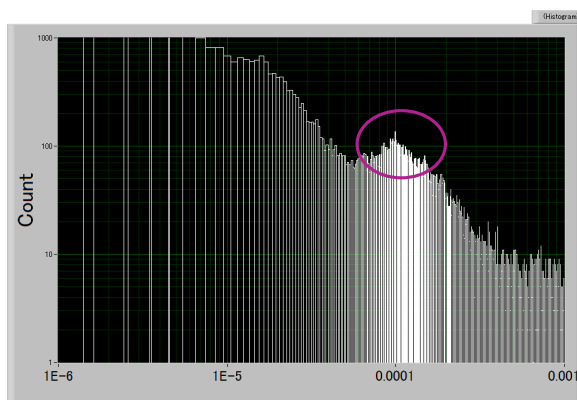
- HS-2T-SH



- HS-4T-SH



- HS-6T-SH



In the results, the presence of the peaks on the HS-4T-SH molecule is not very clear, thus more testing must be done to confirm the actual conductance value of the molecule.

Part 2: Home-built STM (Noise level checking)

In the previous setup, a combination of rotary pump, turbo pump and ion pump was used during the experiment work. This time, the interest is to check how much the noise level would vary when the combination of just the rotary pump and low noise turbo molecular pump is used. Current result shows that the noise level is in an acceptable stage. However, there is concern on the vacuum pressure level, which takes a very long time to reach the $\sim 10^{-4}$ Pa level even after leaving it on for more than 1 day.

Next Plan

1. To continue the break-junction testing for the oligothiophene molecules.
2. To repeat the break-junction testing for Ie-sensei's molecule.
3. To check the setup of the home-built STM system again.