# 分子配向を制御した直交型ポルフィリン・イミドの単分子整流特性

## Single Molecule Rectifying Property of Perpendicularly Connected Porphyrin-Imide with Controlled Molecular Orientation

阪大院理 [1]，阪大院基礎工 [2]　○(D) Chen Zhijin[1]，谷 洋介 [1]，山下　健一 [1]，山田 亮 [2]，
夛田 博一 [2]，小川 琢治 [1]

Grad. Sch. Sci. Osaka Univ.[1], Grad. Sch. Eng. Sci. Osaka Univ.[2], ○Zhijin Chen[1], Yosuke Tani[1], Ken-ichi Yamashita[1], Ryo Yamada[2], Hirokazu Tada[2], Takuji Ogawa[1]

E-mail: chenz14@chem.sci.osaka-u.ac.jp

In previous research, perpendicularly connected porphyrin-imide molecule was proposed [1] and has been confirmed to possess high single molecular rectification performance. However, the rectifying direction remained unknown because it was unable to control the orientation of molecule **1** (Figure 1) during mechanically controllable break junction measurement due to the symmetrical anchoring groups.

To research the rectifying direction of perpendicularly connected porphyrin-imide, we synthesized the molecule **2** (Figure 1) with thiol group on imide side as anchoring group, and use the porphyrin ring as another anchoring group.[2] These two asymmetrical anchoring groups allow us to coat the molecule on gold substrate with controlled orientation by taking advantage of the strong interaction between thiol and gold. A Molecular Imaging Scanning Tunneling Microscope (STM) was set up with a Nanonis STM Controller and controlled by a home-made LabView controlling program to detect molecular junction without disturbing the orientation of molecules on gold substrate (Figure 2).[3] Therefore, *I-V* curve of the molecule can be measured with controlled orientation to determine the rectifying direction of **2**. In this presentation, the setting up of the STM system will be introduced and the result of *I-V* measurement of porphyrin-imide molecule will be discussed.

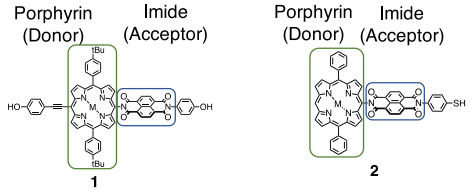


Figure 2 Perpendicularly connected porphyrin-imide.

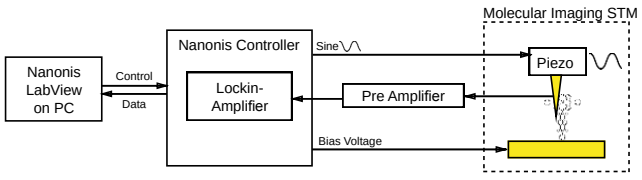


Figure 2 Set-up scheme of STM for detecting molecular junction.

### 参考文献

[1] Handayani, M.; Gohda, S.; Tanaka, D.; Ogawa, T. *Chem. Eur. J.,* **2014**, *20* (25), 7655–7664.

[2] Tamaki, T.; Ohto, T.; Yamada, R.; Tada, H.; Ogawa, T. *ChemistrySelect* **2017**, *2*, 7484.

[3] Díez-Pérez, I.; Hihath, J.; Lee, Y.; Yu, L.; Adamska, L.; Kozhushner, M. A.; Oleynik, I. I.; Tao, N. *Nat. Chem.* **2009**, *1* (8), 635–641.