Stereochemical Recognition of thiaheterohelicene derivatives Investigated by STM and Raman scattering spectroscopy

Y. Kuwahara[1], T. Hattori[1], P. Krukowski[2], C. Ye[1],
A. Saito[1], Y. Hamamoto[1], Y. Morikawa[1], and H. Osuga[3]

[1] *Department of Precision Engineering, Graduate School of Engineering, Osaka Univ.*
[2] *Department of Solid State Physics, Faculty of Physics and Applied Informatics, Univ. of Lodz*
[3] *Department of Materials Science and Chemistry, Faculty of Systems Engineering, Wakayama Univ.*

kuwahara@prec.eng.osaka-u.ac.jp

Helicenes are a class of chiral-molecular-compounds in which ortho-condensed polycyclic rings lead to angularly annulated shapes due to steric hindrance between tailing aromatic rings. Recently, many fundamental research on carbohelicenes and heterohelicenes have been carried out because of their unique structural and optical properties which are important for applications.[1] Scanning tunneling microscopy (STM) investigation at a single-molecule scale is a promising approach and have aroused great interest for better understanding the fundamental principles of the molecular recognition with molecular scale resolution.[2-5] One of the most important questions is an identification of the molecular chirality of adsorbed species and understanding of hierarchal progression of the chirality-recognition through the formation of highly ordered layers.

In this paper we report investigations of molecular adsorption and stereochemical recognition of a racemic mixture of [5]thiaheterohelicene (rac-[5]TH) and [7]thiaheterohelicene (rac-[7]TH) and their derivatives on the metal surfaces using STM (Figure 1). High resolution STM images allow us to unambiguously identify the absolute handedness of enantiomeric species, leading to the important perspective of stereochemical chiral recognition based on the formation of a highly ordered molecular monolayers. In addition, we show results of inelastic light scattering from rac-[5]TH and rac-[7]TH molecules adsorbed on the Ag(111) surface using a surface-enhanced Raman scattering spectroscopy[2,4] combined with theoretical calculation based on a density functional theory.

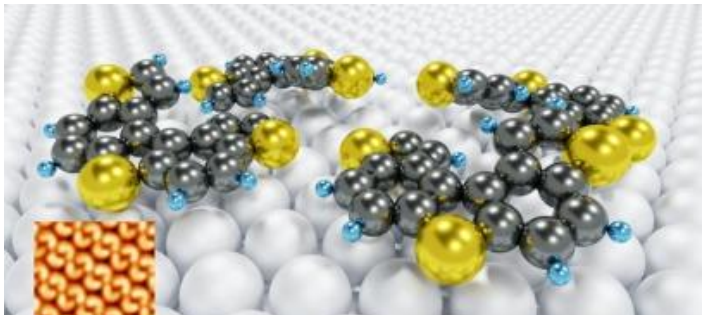

Figure 1. the model of the rac-[5]TH adsorbates and their STM image. [3]

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