

Formation of Homochiral Glycine/Cu(111) Quantum Corral Array

Realized Using Alanine Nuclei

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The understanding and control of self-organization is a key factor for the development of functional devices based on a variety of molecular characteristics. Among them, chirality plays an important role, for example, in molecular recognition, polymerization, optical functionalization and catalytic reactions. Recently, STM was applied to the study of self-assembled monolayers (SAMs) of glycine and alanine molecules on Cu(001)^{1,2)} and Cu(111)^{3,4)} surfaces, and the obtained results showed that the control of interactions based on chirality and the modification of molecules, the addition of a methylene group to glycine in this case, play key roles in the formation and control of the molecular and electronic structures of SAMs. However, few analyses have been carried out so far on the combination of these factors. Here, as a first step to achieving a new methodology for controlling the

electronic structures of SAMs, we attempted to control the chirality of quantum corrals formed by glycine on a Cu(111) surface by adding α -alanine as nuclei using the ability of chirality recognition between glycine and alanine molecules. Figures 5(a) and 5(b) show the L-alanine molecules adsorbed on a Cu(111) surface and a magnification of the area indicated by the square in (a), respectively. After confirming the structure shown in Fig. 5(a) (with S-chirality), glycine molecules were adsorbed on the surface. As shown in Fig. 5(c), quantum corrals with S-chirality were formed, indicating the possibility that the optical isomers can be separated through a method such as preferential crystallization, in which a crystal consisting of molecules with the same chirality is grown by introducing an optical isomer to a racemic compound. Details will be discussed at the conference.

Reference:

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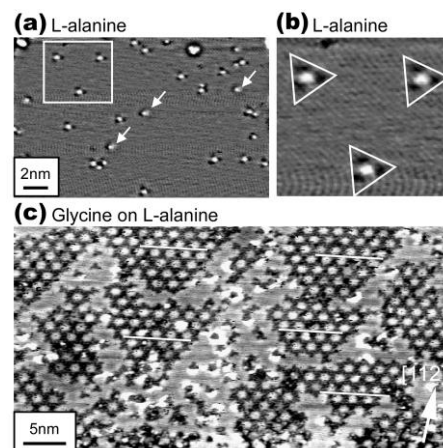


Fig. 1 (a) STM image of L-alanine molecules on a Cu(111) surface and (b) magnification of the area indicated by the square. (c) STM image of quantum corrals formed by glycine molecules deposited onto the surface shown in (a). ($V_s = -0.5$ V, $I_t = 1.0$ nA)