[III~8] [초청]

TOPOGRAPHIC AND FRICTIONAL PROPERTIES OF SELF-ASSEMBLED ORGANIC MONOLAYERS

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Abstract

Formation of self-assembled organic monolayers on metal provides a powerful method for the modification of surface properties at the molecular level. Such self-assembled monolayers have been characterized by many analytical techniques such as external reflectance Fourier transform infrared spectroscopy, ellipsometry, contact angle measurements, X-ray photoelectron spectroscopy, and electrochemistry. All of the techniques provide valuable information for understanding of the molecular structure, surface energy, thickness, chemical species, and electron transfer mechanism.

The recent development of scanning probe microscopy (SPM) has shown the highest spatial resolution. In favorable cases, it can provide two dimensional images of single atoms and molecules at surfaces. Furthermore, SPM can provide surface properties such as friction, viscoelasticity, surface states. Thus, the use of SPM has been widely used in order to understand nanoscopic nature of surfaces.

We have employed SPM in order to understand packing structures and frictional properties of self-assembled organic monolayers. A simple n-octadecanethiol was self-assembled from the ethanolic thiol solution onto a gold substrate. The gold substrate was prepared by thermal evaporation on V-2 grade Muscovites, which offered a Au(111) surface. The Au(111) surface and subsequent self-assembled n-octadecanethiol on gold were successfully imaged at the atomic level in air by the scanning tunneling microscope (STM) mode. In order to understand frictional properties of organic monolayers, the lateral force microscope (LFM) mode was used and a Au(111) surface was modified with two different functional groups using a technique developed by Whitesides and coworkers [1]. The resulting surface shows a pattern of a grid which is covered with a carboxyl and a pyrrolyl group. The operation of the LFM results in the identification of frictional differences on the different functional groups although there were no topographic contrast.