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第99回　ISIT有機光エレクトロニクス研究特別室セミナー
第166回　未来化学創造センターセミナー

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“Controlling Interfacial Interactions of π-Conjugated Molecules on Noble Metal Surfaces”

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It is now recognized that interfacial contacts between p-conjugated molecules and metal electrodes play roles as important as the molecules themselves in molecule-based electronics. The interfaces between molecules and metal electrodes are where charge transfers between active components and electrodes occur in organic thin-film devices, and such interfacial contacts are also present in any persuasive model for molecular devices. In addition, various interactions at the interfaces between molecules and metal electrodes (i.e., surface-molecule and intermolecular interactions) are of great importance in organic epitaxy and the architecture of nanostructures or molecular networks in reference to size and structural control of the system, and the registry of a molecule on a metal surface governed by interfacial interactions has strong correlation with the subsequent film growth and its electronic structure. Thus, how to understand and control interfacial interactions is one of today’s challenging issues not only in the field of surface science, but also in various other fields of science and engineering.

“***How to understand and control various interfacial interactions between p-conjugated molecules and noble metal surfaces***” will be discussed with well-designed model systems by means of scanning tunneling microscopy (STM), scanning tunneling spectroscopy (STS), and density functional theory (DFT) calculations. Noble metals have been widely used as electrodes for molecule-based devices owing to their chemical inertness, differently from other transition metals which cause oxidation or instability. The use of noble metal substrates makes it possible to control surface-molecule interactions corresponding to the work-function of metal, surface lattices and surface templating. Moreover, since p-conjugated molecules normally lie flat on noble metal surfaces, tuning interfacial interactions can be achieved by careful design of the molecules. Here, the geometric and electronic structures of p-conjugated molecules on noble metal surfaces were probed by STM and STS measurements, and DFT calculations also performed to elucidate the experimental results and to describe interfacial interactions in detail.

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