Surface Coordination Space Organized at the Molecular Level

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This project aims at developing methods to fabricate molecular assemblies and coordination space, which are organized at molecular level to such an extent that individual molecules can be observed with scanning tunneling microscopy (STM), based on coordination interactions on solid surfaces. We used highly oriented pyrolytic graphite (HOPG) as the substrate and revealed with STM the structures of surface assemblies, which were formed at the liquid/solid interface in phenyloctane or at the air/solid interface after volatile solvent such as toluene was evaporated.[1] The major achievements in this project include: (1) Surface arrangements were revealed for a Pt-coordinated linear porphyrin dimer. (2) New surface patterns and columnar structures, which are potential supramolecular wires for electron and exciton transport, were obtained by introducing a structural perturbation into the part of alkyl chains in the molecule, which is a new concept for surface patterning. (3) Labile axial ligands to zinc-porphyrin organized at the liquid/solid interface can be visualized clearly by STM.[2] The STM even distinguishes the cis and trans isomers of an azobenzene derived axial ligands. (4) Double decker porphyrin derivatives form organized arrays on the surface.[3] A possibility was suggested that the rotation of molecules immobilized on a surface may be directly visualized. (5) Even nonplanar octahedral metal complexes, into which long alkyl chains are introduced, are made into organized arrays.[4] The "nanoslips" formed immediately after drop-casting grow into "microslips" upon thermal annealing. Optically resolved experiments[5] showed that chirality plays an important role in the formation of the surface assembly.

References

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