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Self-assembly of organic chromophore nanostructures

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The supramolecular arrangement of porphyrins and other organic molecules has great potential in the fields of molecular information storage and sensing due to their ease of deposition and good chemical and thermal stabilities. In particular, porphyrins of relatively large molecular weights can be applied in thermal deposition while tetrapyrrole molecules have had an extensive synthetic chemistry developed, which enables synthesis of complex derivatives. In this work, we present complementary examples of porphyrin nanoarchitectonics. Starting from simple symmetrical phenol derivatives, we describe the effects of steric hindrance about the respective hydroxyl groups and also the effects of conformational variation on the self-assembly structures. We also investigated fabrication of binary molecular monolayers using two different porphyrin molecules *tetrakis*(3,5-di-t-butyl-4-hydroxyphenyl)porphyrin and *tetrakis*(4-pyridyl)porphyrin by deposition in ultrahigh vacuum. This leads to two unusual heteromolecular monolayer structures were observed with one exhibiting good separation of molecules within the monolayer. Meanwhile, a synthetic nanoarchitectonic approach was used to prepare self-assembled molecular nanowires at a mica substrate. The nanowires could be observed growing using atomic force microscopy (AFM) and the network structures of the nanowires can be influenced by manipulation using the AFM probe tip. Formation of molecular monolayers with chromophores positioned remote from the substrate surface will also be discussed.

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