Multilevel Molecular Assemblies: 
Structure, Dynamics and Function

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Nanopatterning with molecules at a liquid-solid interface: from structure to function

A relatively new but exciting development in self-assembly is the formation of 2D surface-confined porous patterns, i.e. supramolecular networks with empty space. There are compounds which intrinsically contain a cavity such as macrocycles. Upon 2D self-assembly, a regular lattice of these macrocycles (and therefore also the cavities) can be formed, which subsequently can be addressed by guest molecules. Scanning probe microscopy, and especially scanning tunnelling microscopy, is able to reveal the details of these surface-confined structures.

However, such porous structures can also be formed by intrinsically non-porous molecules. These porous networks are typically sustained via hydrogen bonds, metal-ligand coordination or even van der Waals interactions. Alkoxyalted hexadehydrotribenzo[12]annulene (DBA) derivatives are ideal building blocks for the formation of porous 2D molecular networks. Here we report the formation of 2D porous networks with tunable cavity size, ranging from 2 up till 7 nm, at the liquid-solid interface. Two different strategies have been discovered to induce the formation of porous networks - concentration control and guest induced transformation - creating a platform for the construction of more complex multicomponent 2D patterns, and revealing insight in the kinetic and thermodynamic aspects of self-assembly at the liquid-solid interface.

Invited by Prof. Dr. Lifeng Chi