

Title:
**Hydrogen-bonding in
bi-component supramolecular nanoporous networks**

Authors:
Jonas Björk*, Matthew S. Dyer and Mats Persson
Surface Science Research Centre and Department of Chemistry,
University of Liverpool, Liverpool, UK

Carlos-Andres Palma and Paolo Samori
Nanochemistry Laboratory, ISIS - CNRS 7006,
Universite de Strasbourg, Strasbourg, France

Massimo Bonnini
BASF SE, GKD/I
Ludwigshafen, Germany

Anna-Llanas Pallas and Davide Bonifazi**
Dipartimento di Scienze Farmaceutiche,
Universita` degli Studi di Trieste, Trieste, Italy
** also at
Department of Chemistry, University of Namur, Namur, Belgium

* Presenting author

Abstract:

We study the formation of four supramolecular bi-component networks based on four linear modules (linkers) bridging melamine via triple hydrogen-bonds. Scanning tunnelling microscopy (STM) experiments together with density-functional theory (DFT) calculations were used to explore the polymorphism and phase segregation, which rule the generation of highly crystalline nanoporous networks at the solid-liquid interface. The investigated linkers include two systems exposing diuracil groups in the C^{\pm} and C^{a} position, naphthalene tetracarboxylic diimide and pyromellitic diimide. In situ STM investigations revealed that, when blended with melamine, the first three systems are able to form two-dimensional porous architectures. Two of the linkers, exhibit highly ordered hexagonal structures while the third one gives a polymorph structure consisting of a variety of polygons. However, the fourth linker, pyromellitic diimide, assembles only into one-dimensional supramolecular arrays. DFT calculations of the hydrogen-bond energies for the different systems were able to show that the distribution of polygons depends on the backbone flexibility of the linkers. These comparative studies offer new insights into strategies towards the bottom-up fabrication of highly ordered tunable nano patterning at interfaces mediated by hydrogen bonds.