

Seminář odd. 26

Tenkých vrstev a nanostruktur

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TÉMA

On-surface polymerization and self-assembly of molecular nanostructures: From metal to insulator surfaces

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The interest in molecular nanostructures on surfaces emerges from their prospective applications in nanoscale electronics, solar cells, energy storage devices, and other fields. Non-covalent intermolecular interactions in self-assemblies facilitate the formation of long-range ordered patterns. In contrast, the on-surface synthesis of covalent molecular structures improves the stability and intermolecular charge transport at the expense of structural control owing to the irreversible nature of the newly formed covalent bonds, which prevents an error correction.

Here, we review recent high-resolution scanning probe microscopy experiments complemented by density functional theory on non-covalent and covalent molecular structures built from carefully designed functionalized triphenylamines. First, hierarchic formation principles of covalently-linked nanoporous networks through surface-assisted Ullmann coupling reactions are shown. Design rules to potentially overcome the lack of long-range order in such networks will be discussed together with their electronic properties and host-guest chemistry. In the second part, electronically decoupled self-assemblies on bulk insulators are presented. We show how intermolecular and molecule-substrate interactions can be tuned by functional groups in order to achieve one-, two- or three-dimensional assemblies in a controlled way.

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