physikalisches Kolloquium

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Bottom-up fabrication of atomically precise molecular nanostructures through on-surface synthesis

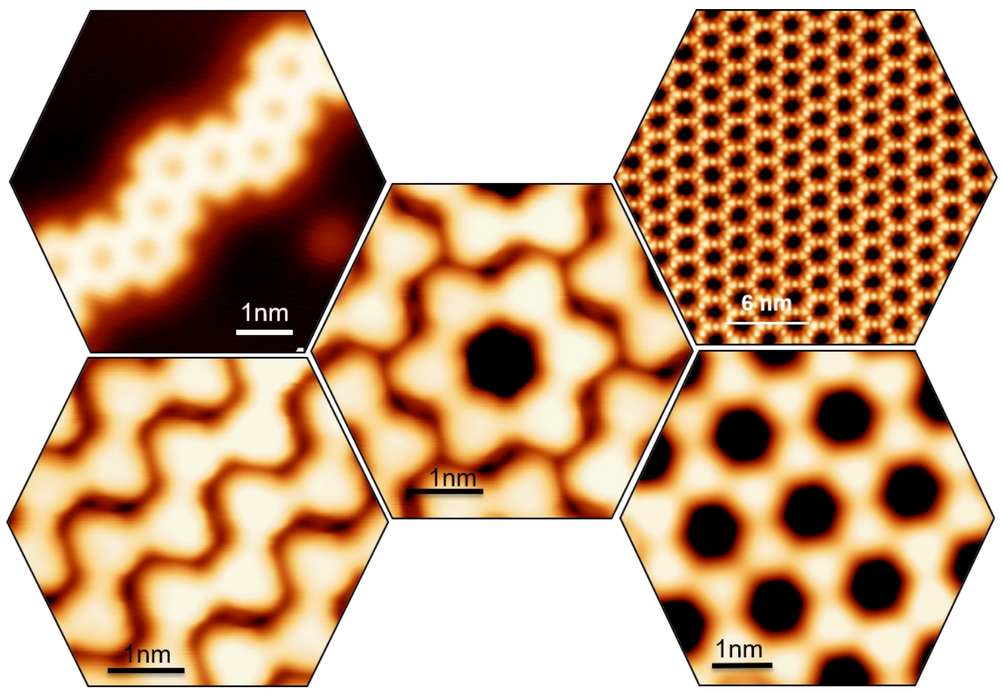
Mo. 02.07.18
16:00 Uhr
Ort: H34

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 molecular self-assemblies facilitate the formation of long-range ordered patterns by usage of molecular recognition. In contrast, the stability and intermolecular charge transport are improved in covalently coupled molecular structures fabricated by on-surface synthesis, however, often at the expense of structural control owing to the irreversible nature of the newly formed covalent bonds.

In my presentation, I focus on recent high-resolution scanning probe microscopy experiments about the bottom-up fabrication and electronic properties of atomically precise one- and two-dimensional molecular nanostructures on metals.[1-3] I will outline how nanoporous carbon ribbons [1] and 2D covalent networks,[2-3] can be fabricated through on-surface synthesis by use of debromination coupling reactions. We observed a narrowing of the band gap from the single molecule to the 2D triphenylamine-based materials due to the extension of the π-system. Moreover, we found also delocalized electronic states in surface-supported organometallic networks assembled by Ag-bis-acetylide bonds.

A major challenge in realizing single molecular electronic devices is to mechanically stabilize and electronically decouple molecules at and from a surface. Hence, I will conclude with a comparison on the structure formation of molecular self-assemblies on bulk insulator and metal surfaces.

[1] M. Ammon, T. Sander, S. Maier, J. Am. Chem. Soc., 139 (37), 12976–12984 (2017).
[2] C. Steiner et al. Nature Communications, 8, 14765 (2017).
[3] Z. Yang et al. Nanoscale, 10, 3769-3776 (2018).



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