Czech Chemical Society Lecture

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University Campus Bohunice, Kamenice 5, Building B11/room 132

New perspectives for chemistry: on-surface chemistry and scanning probe microscopy

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It is a bit of an exaggeration to say that scanning probe microscopy represents our eyes and hands in the nanoworld. The invention of scanning microscopy in the 1980s not only enabled the atomic resolution of individual atoms on solid surfaces, but was also an important factor in the advent of the era of nanotechnology.
The development of scanning microscopy in recent years has brought another important milestone: the possibility of chemical resolution of individual molecules on solid surfaces. Among other things, it allows direct real-space imaging of benzenoid structures of molecules. This technique, combined with recent development of chemical reactions on solid surfaces, opens up completely new possibilities for the preparation and characterization of molecular nanostructures.

In the lecture we will introduce the basic principles of scanning microscopy, including the chemical resolution of individual molecules. We present examples of the synthesis of molecular structures and their characterization, which are not available by traditional methods of chemical synthesis in solutions. In particular, the synthesis of polymers on surfaces in an ultra-high vacuum environment allows us to study not only their structural changes of individual polymers (so-called π-conjugation), but also charge transport through just one polymer. In case of sufficient time, it will demonstrate the controlled transfer of one electron between redox states within one molecule and the measurement of the corresponding quantum dissipation.

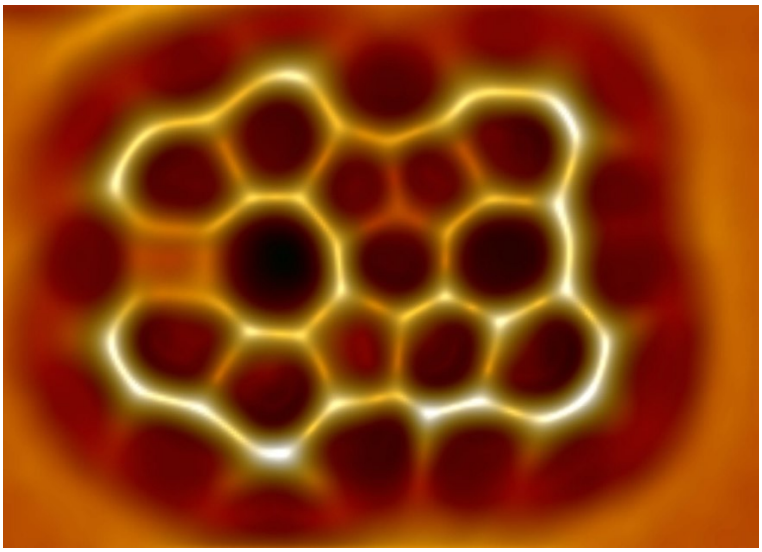

Figure Real-space image of non-alternant non-benzenoid polycyclic aromatic hydrocarbon compounds containing 4 to 8-membered rings synthetized by on-surface synthesis from helical precursors.