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IMAGING HIGH-ASPECT RATIO NANOSTRUCTURES ON SOFT AND BRITTLE MATERIALS USING ATOMIC FORCE MICROSCOPY

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Atomic Force Microscopy (AFM) is a powerful imaging technique which provides very high-resolution images and topological data in scales of nanometers. The quality of the obtained data is determined by quality of used AFM tip and fine adjustment of measuring parameters and settings of the machine. The measurement becomes more challenging if the AFM probe is about to approach a soft and elastic surface such as silica gel polymers (polydimethylsiloxane) or biological membrane surfaces (insect wings) which due to their properties tend to bend and vibrate under the probe during scanning. The polymers tend to stick to the bottom of the tip and confuse the software controlling piezo motors during approach causing either false approach or putting a force on the sample, so it bends to concave meniscus or even puncture the sample surface. These malfunctions become even more problematic if a dense high-aspect ratio nanopillar network occurs on such surfaces. Yet, the ability to measure raw materials without any need of surface modification (as often needed for non-conductive materials for electron microscopy) is a decisive advantage for attempting to use AFM even on such materials. Here we present AFM topography characterization of dragonfly wings nanostructure and their polymer replicas manufactured from various soft polymers.

Presenter: ČERNÝ M. (Department of chemical physics and optics, Faculty of Mathematics and Physics, Charles University, Prague)

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