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Swiss Science Concentrates

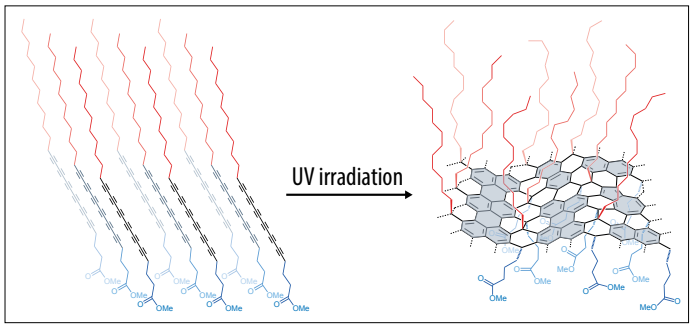
A CHIMIA Column

Short Abstracts of Interesting Recent Publications of Swiss Origin

Functional carbon nanosheets prepared from hexayne monolayers at room temperature

S. Schrettl, C. Stefaniu, C. Schwieger, G. Pasche, E. Oveisi, Y. Fontana, A. Fontcuberta i Morral, J. Reguera, R. Petraglia, C. Corminboeuf, G. Brezesinski, and H. Frauenrath*, *Nat. Chem.* **2014**, *6*, 468. EPFL

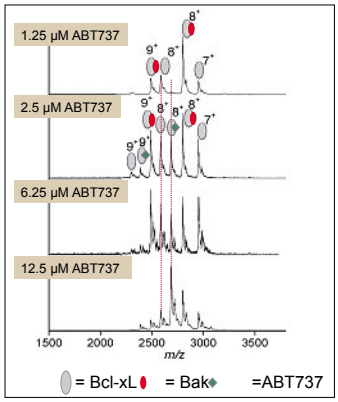
Carbon nanostructures are interesting components for novel composites, organic electronic materials, or membranes. A novel method for the preparation of two-dimensionally extended carbon nanosheets based on the synthesis, self-assembly, and subsequent carbonization of hexayne amphiphiles at the air-water interface is presented. UV irradiation of a monolayer of the reactive molecular precursors at room temperature furnished a carbon nanosheet with a defined thickness of 1.9 nm and lateral dimensions on the order of centimeters. The mechanically stable nanosheets with their defined surface chemistry proved useful as low background-contrast substrates for high-resolution transmission electron microscopy and may turn out to be suitable for many other applications as well.



Direct monitoring of protein–protein inhibition using nano electrospray ionization mass spectrometry

D. Cubrilovic, K. Barylyuk, D. Hofmann, M. J. Walczak, M. Gräber, T. Berg, G. Wider, and R. Zenobi*, *Chem. Sci.* **2014**, *5*, 2794. ETH Zurich

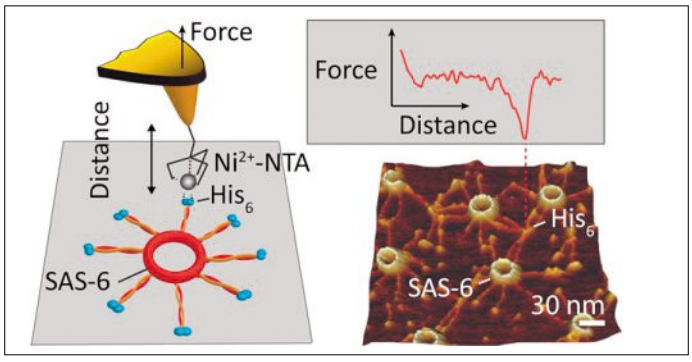
Protein-protein interactions (PPI) are of fundamental importance in most biological processes. The controlled disruption of PPIs by small molecule inhibitors is therefore of vital interest for the development of new therapeutics. Zenobi and coworkers demonstrate that nanoESI-MS is a suitable method to measure such dissociation processes. For this purpose, they investigated the inhibition of heterodimer formation of the survival protein Bcl-x_L and cell death promoting regions of proteins Bak and Bad by small molecule inhibitors ABT737 and ABT263. The results obtained by nanoESI-MS are in excellent agreement with other biophysical methods. Thanks to its speed and sensitivity, nanoESI-MS could be widely applied to study PPI inhibition.



Localizing Chemical Groups while Imaging Single Native Proteins by High-Resolution Atomic Force Microscopy

M. Pfreundschuh, D. Alsteens, M. Hilbert, M. O. Steinmetz, and D. J. Müller*, *Nano Lett.* **2014**, *14*, 2957. ETH Zurich

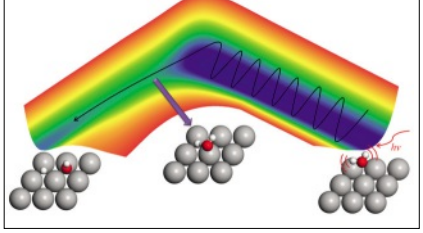
The localization and quantification of interaction or binding sites on native proteins is crucial to understand and manipulate their behavior. This challenging task can be accomplished by using force-distance curve-based atomic force microscopy (AFM). For this purpose, AFM tips are functionalized with Ni^{2+}-nitrilotriacetate groups that interact with histidine residues. Relying on this strategy, Müller and his group could determine the specific interaction sites on single native SAS-6 proteins, that self-assemble into cartwheel like structures, as well as the binding strength of Ni^{2+}-nitrilotriacetate groups to histidine residues. Importantly, the authors suggest that this strategy can be adapted to detect any other specific interactions.



Vibrationally Promoted Dissociation of Water on Ni(111)

P. Morten Hundt, B. Jiang, M. E. van Reijzen, H. Guo, and R. D. Beck*, *Science*, **2014**, *344*, 504. EPF Lausanne

Water dissociation on transition metals is an important step in steam reforming and the water-gas shift reaction. Combining molecular beam and state specific reactant preparation by laser techniques, Beck and co-workers analysed the influence of vibrational and translational energy on the dissociative chemisorption of D_2O on a Ni(111)-surface. Their data show that OH-stretch excitation of D_2O promotes the reaction more effectively than the translational energy which is consistent with a late barrier along the O-D stretch reaction coordinate. The experimental results were used to guide first principles calculations for this system by the group of H. Guo with the goal of developing a predictive understanding of this reaction which may eventually lead to the design of more efficient catalysts for valorisation of shale gas.



Prepared by Christophe Daeppen, Valentin Köhler, Raphael Reuter, Mariana Spulber, Adrian von der Höh and Thomas R. Ward

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