

Surface chemistry of hydrocarbons – from small molecules to graphene and liquid organic hydrogen carriers

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X-ray photoelectron spectroscopy (XPS or ESCA) is a versatile tool to investigate chemical reactions on surfaces. At third generation synchrotron radiation facilities, such as BESSY II in Berlin, XPS studies can be performed with high resolution and *in situ*, during adsorption or during heating. From the binding energies of the adsorbate and substrate core levels, detailed information not only on the chemical composition, chemical state and adsorption sites, but also on the vibronic final state in the photoemission process itself can be derived. In this presentation, three different examples concerning the adsorption of hydrocarbons will be addressed [1]. The first deals with the adsorption of small saturated and unsaturated hydrocarbons on metal surfaces. From high-resolution XP spectra, detailed information on adsorption sites, dissociation and the formation of new species are derived. The second example addresses the formation of supported graphene on metal surfaces, including the introduction of hetero-atoms such as nitrogen and boron in the lattice. Finally, the third example concerns the adsorption and reaction of a much more complex molecule, namely the liquid organic hydrogen carrier (LOHC) dodecahydro-N-ethylcarbazole, on metal surfaces. Hydrogen storage in LOHCs is a possible future technology to circumvent the challenges in hydrogen storage.

[1] C. Papp and H.-P. Steinrück, *Surface Science Reports* 68 (2013) 446-487.



Prof. Hans-Peter Steinrück is investigating the physics and chemistry of surfaces since more than 30 years, 1982-1985 at the *TU Graz / Austria*, 1985/1986 at *Stanford University / USA*, 1986-1993 at the *TU München / Germany*, 1993 at *Rutgers University / USA*, 1994-1998 at the *Universität Würzburg / Germany* und since 1998 at the *Universität Erlangen-Nürnberg / Germany*. In addition, he is Guest Professor at the *University of Science and Technology of China (USTC)* in Hefei / China since 2009.

In March 1998 Prof. Steinrück was appointed to the *Chair of Physical Chemistry II* at the Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) and since then he built up an active international and interdisciplinary research group. He is Principle Investigator (PI) in the Cluster-of-Excellence EXC 315/1 "*Engineering of Advanced Materials - Hierarchical Structure Formation for Functional Devices*", which was granted to the Universität Erlangen-Nürnberg in 2007. This adds to the funding of

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The *scientific output* of this research is documented in more than 255 publications in refereed international journals and more than 165 invited lectures at international conferences and scientific institutions.