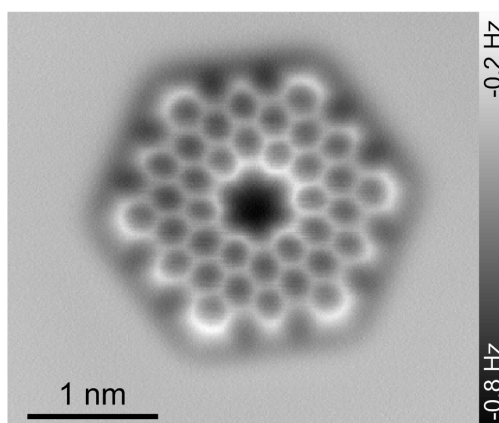
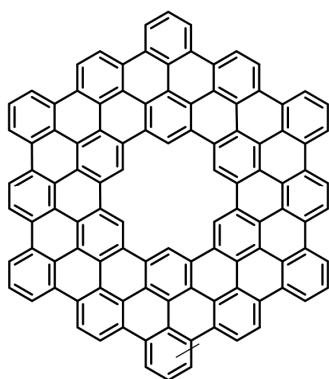


# Surface Science of Low-Dimensional Carbon-Based Nanostructures

J. Michael Gottfried

*University of Marburg, Germany*

Low-dimensional carbon-based nanostructures have attracted considerable attention for applications such as energy conversion and organic (opto-)electronics. In these fields of technology, interfaces often play a crucial role and determine the performance of the related devices. Therefore, the quantitative characterization and understanding of interfaces, especially metal/organic interfaces, is decisive for future rational developments in these areas. In this lecture, two aspects will be addressed: First, I will present strategies that make use of inherent catalytic and template effects to create low-dimensional nanostructures directly at surfaces and interfaces. This approach provides access to products that are not available from conventional synthesis. Examples include conjugated macrocycles such as honeycombenes, cycloarenes and superphthalocyanines, as well as one-dimensional structures such as graphene nanoribbons and conjugated carbon-nitrogen polymer chains [1]. In addition, novel two-dimensional fractal structures will be introduced. Second, I will discuss aspects of electronic interaction and reactivity at metal-organic interface of cyclic conjugated structures. By a quantitative comparison of a non-alternant aromatic system with its alternant isomer, it will be discussed how the  $\pi$ -topology affects the surface chemical bond. Tetrapyrroles such as porphyrins, phthalocyanines and corroles represent another interesting and important class of conjugated macrocycles. I will focus here especially on recent work with corroles [2] and compare their surface interactions to those of the ubiquitous porphyrins and phthalocyanines [3].



## References

- [1] M. Chen, J. Shang, Y. Wang, K. Wu, J. Kuttner, G. Hilt, W. Hieringer, J. M. Gottfried, On-Surface Synthesis and Characterization of Honeycombene Oligophenylene Macrocycles, *ACS Nano* 11 (2017) 134-143.
- [2] M. Schmid, M. Zugermeier, J. Herritsch, B.P. Klein, C.K. Krug, L. Ruppenthal, P. Müller, M. Kothe, P. Schweyen, M. Bröring, J.M. Gottfried, On-Surface Synthesis and Characterization of an Iron Corrole, *J. Phys. Chem. C* 122 (2018) 10392-10399.
- [3] J.M. Gottfried, Surface Chemistry of Porphyrins and Phthalocyanines, *Surf. Sci. Rep.* 70 (2015) 259-379.

## Biography

Prof. Michael Gottfried studied Chemistry at the Universities of Darmstadt, Berlin (Germany) and St Andrews (UK). He received his PhD degree in 2003 from the Free University of Berlin, Germany, under the supervision of Prof. Klaus Christmann. After postdoctoral work with Prof. Charles T. Campbell (2003-2004), he became a research group leader at the University of Erlangen-Nürnberg (2004-2011). In 2011, he became a Professor of Physical Chemistry at the University of Marburg. He was a guest professor at the University of Science and Technology of China and received various awards including the SCS Lectureship Award of the Swiss Chemical Society. His current research focuses on surface and interface related aspects of carbon-based nanostructures, porphyrins and phthalocyanines, and metal/organic contacts.

