



CRC Seminar Series

DATE: 22 July 2021
TIME: 3:00 PM – 5:00 PM
LOC: Online Zoom Meeting



GUEST SPEAKER:

Prof. Dr. Siegfried Eigler

AG Eigler, CarbonNanoMaterials, Freie Universität Berlin

TITLE:

„Chemistry and physical properties of graphene with wet-chemically prepared defects“

ABSTRACT:

With developing the chemistry of graphene, it became clear that lattice-defects in graphene are decisive to understand reactivity and physical properties of derived materials.^[1] About one decade ago, we succeeded in synthesizing graphene in a wet-chemical approach, starting from flakes of graphite by isolating the processible intermediate oxo-functionalized graphene (oxo-G).^[2] With oxo-functionalization of graphene, the graphene lattice remained by far intact, contrasting the lattice integrity of graphene oxide. Such oxo-G can now be utilized as a platform to investigate chemical reactions proceeding at the surface or rims of the material, depending on the density of defects. With the gained understanding, different synthetic methods to oxo-G could be developed and the materials electronic properties were investigated by transistor devices.^[3, 4, 5] In addition, the thermal disproportionation of oxo-G was investigated and local semiconductive charge transport properties were revealed.^[6] Moreover, defects possess a guiding effect for the regiochemical addition of addends, as shown for chemical and electrochemical methods.^[7] Recently, we investigated the growth of pores

in graphene, starting from vacancy defects and pores with diameters of up to 500 nm can be fabricated without disintegration of flakes.^[8] Here, I present the recent results in those areas.

- [1] P. Feicht, S. Eigler, *ChemNanoMat* **2018**, *4*, 244.
- [2] S. Eigler, M. Enzelberger-Heim, S. Grimm, P. Hofmann, W. Kroener, A. Geworski, C. Dotzer, M. Rockert, J. Xiao, C. Papp, O. Lytken, H. P. Steinrück, P. Müller, A. Hirsch, *Adv. Mater.* **2013**, *25*, 3583.
- [3] P. Feicht, J. Biskupek, T. E. Gorelik, J. Renner, C. E. Halbig, M. Maranska, F. Puchtler, U. Kaiser, S. Eigler, *Chem.-Eur. J.* **2019**, *25*, 8955.
- [4] Z. Wang, Q. Yao, Y. Hu, C. Li, M. Hußmann, B. Weintrub, J. N. Kirchhof, K. Bolotin, T. Taniguchi, K. Watanabe, S. Eigler, *RSC Adv.* **2019**, *9*, 38011.
- [5] Z. Wang, Q. Yao, S. Eigler, *Chem. Eur. J.* **2020**, *26*, 6484.
- [6] Z. Wang, Q. Yao, C. Neumann, F. Borrner, J. Renner, U. Kaiser, A. Turchanin, H. J. W. Zandvliet, S. Eigler, *Angew. Chem. Int. Ed.* **2020**, *59*, 13657.
- [7] C. E. Halbig, R. Lasch, J. Krull, A. S. Pirzer, Z. Wang, J. N. Kirchhof, K. I. Bolotin, M. R. Heinrich, S. Eigler, *Angew. Chem. Int. Ed.* **2019**, *58*, 3599.
- [8] C. N. Y. Wang, M. Hußmann, Q. Cao, Y. Hu, O. Garrity, P. Kusch, A. Turchanin, S. Eigler, *Adv. Mater. Int.* **2021**, 10.1002/admi.202100783.

PROFILE OF PROF SIEGFRIED EIGLER:

Siegfried Eigler received his PhD in organic chemistry from the Friedrich-Alexander-Universität Erlangen-Nürnberg in 2006. Subsequently, he conducted basic research on electrically conductive polymers and graphene oxide as an industry chemist. In 2016 he accomplished habilitation at Friedrich-Alexander-Universität Erlangen-Nürnberg and became Associate Professor at the Chalmers University of Technology. Now, he is Professor at Freie Universität Berlin and his research focuses on the controlled chemistry of graphene, synthesis and evaluation of fluorophores and fabrication of devices.