The unique interplay between interfacial chemistry and electronic structure in graphene

Kannan Balasubramanian, Michel Wehrhold, Tilmann J Neubert, Anur Yadav, Tobias Grosser, Nur Selin Kaya, Emil Fuhry
Humboldt Universität zu Berlin, 10099 Berlin, Germany
nano.anchem~at~hu-berlin.de

Abstract

For many envisioned applications using graphene, such as sensors, fuel cells and electrocatalysts, it is of utmost importance to have a detailed understanding of various physicochemical aspects of the interface of graphene with its immediate environment. [1] This need arises due to the unique material properties of graphene: electron transport in graphene is purely two-dimensional, the electronic density at graphene is much lower in comparison to metal electrodes, and electron transfer across the interface is expected to have a strong effect on the graphene electronic structure itself. Moreover, functional groups and metallic structures on and around graphene (either present or introduced deliberately) will affect the electronic structure and the chemistry of graphene. [2] In this talk, we present basic examples of how the interfacial properties dictate the behavior of graphene in a liquid environment. Specifically, we demonstrate how electrostatic effects at the graphene interface [3] modulate the kinetics of electron transfer, and how electron transfer in turn affects the electronic properties of graphene. Moreover, the presence of functional groups and metal structures even in trace amounts [4] either at the basal plane or exclusively at the edge [5] is found to have a significant effect on the electron transfer characteristics.

References

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