1 nm thick functional Carbon Nanomembranes (CNMs): New opportunities for Nanotechnology

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One nanometer thick, mechanically stable carbon nanomembranes (CNMs) are made by electron induced cross-linking of surface bound self-assembled monolayers (SAMs). The cross-linked SAMs are then released from the surface and can be placed onto solid materials or spanned over holes as free-standing membranes. Annealing at ~1000K transforms CNMs into graphene or graphenoids accompanied by a continuous change of mechanical stiffness and electrical resistance from insulating to conducting, which allows the tailoring of the CNM's electrical and mechanical properties [1]. Recently, *Janus membranes*, i. e. CNMs functionalized by coupling different molecules to its top and bottom surfaces were built [2]. Janus membranes have been built with functional polymers, proteins, and dyes, which demonstrates that Janus CNMs can act as platforms for two-dimensional directional chemistry. By combining different types of CNMs, hybrid materials with tailored mechanical, optical and electrical properties can be built.

[1] A. Turchanin, A. Beyer, C. T. Nottbohm, X. Zhang, R. Stosch, A. Sologubenko, J. Mayer, P. Hinze, T. Weimann, A. Gölzhäuser: *1 nm thin carbon nanosheets with tunable conductivity and stiffness*, Adv. Mater. 21, 1233 (2009)

[2] Z. Zheng, C. T. Nottbohm, A. Turchanin, H. Muzik, A. Beyer, M. Heilemann, M. Sauer, A. Gölzhäuser: *Janus nanomembranes: A generic platform for chemistry in two dimensions*, Angew. Chemie Int. Ed. 49, 8493 (2010)