SFB/TRR 21 - Seminar
24. Januar 2014, Ulm

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Engineering of functional free-standing 2D carbon materials from organic monolayers

Free-standing 2D materials differ from thin films in that they exist as isolated forms at some critical stage in their growth or processing, or after their integration into devices. In this talk it will be demonstrated how monolayers of aromatic molecules can be tailored to form atomically or molecular thin free-standing 2D carbon materials. By electron or photon irradiation these organic monolayers are converted into carbon nanomembranes (CNMs) with a thickness of one molecule, which can be tuned from ~0.5 to 3 nm. CNMs possess high mechanical stability and can be separated from their original substrates and transferred onto various other substrates, or stacked into multilayer films with precise control over their thickness and well-defined interlayer boundaries. By annealing CNMs in vacuum or at atmospheric pressure they are converted into graphene. The developed approach makes possible both scalable production of high-electronic-quality graphene or CNMs and their direct growth in various tailored shapes. Layer-by-layer assembly of CNM/graphene heterostructures opens many doors to the engineering of novel nanomaterials for electronics, optics, biofunctional coatings and sensors. Their physical and chemical properties characterized by state-of-the-art microscopy, spectroscopy, electric and magnetoelectric transport measurements, their nanopatterning and device applications will be presented.

References

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24. Januar 2014, 14:00 Uhr

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