



Talk

New materials and nanostructures in and in-between graphene monolayers

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Graphene—the one-atom-thick sheet of carbon—is the most famous of 2D materials due to its unique electronic properties and mechanical strength. However, its chemical inertness makes graphene also an excellent nearly electron-transparent support for other materials and nanostructures. In this presentation, I will give an overview of our recent work enabled by a unique interconnected vacuum system containing an aberration-corrected scanning transmission electron microscope Nion UltraSTEM 100 with a unique objective area that allows sample cleaning via laser, in situ chemical experiments, and direct vacuum transfer to an atomic force microscope (AFSEM by GeTEC Microscopy), to-and-from an argon glove box, target chamber with a plasma ion source and evaporators, and long term vacuum sample storage. In brief, I will demonstrate that defect-engineering of graphene [1] enables its substitutional heteroatom doping [2] and growth of nanoclusters with a well-defined concentration and a narrow size distribution, as well as the direct correlation of its atomic structure and mechanical properties. I will further show that graphene can be used as a support for the growth of 2D CuAu [3] and describe the first steps of the growth of Ti on graphene [4]. Finally, I will provide examples of otherwise unstable structures being stabilized in the van der Waals gap between two graphene sheets, including a mono-layer of fullerenes [5], 2D CuI [6] and small noble gas clusters [7].

References [1] Trentino et al., Nano Lett. 21, 5179-5185 (2021)[2] Inani et al., J. Phys. Chem. C 123, 13136-13140 (2019); Zagler et al., 2D Mater. 9, 035009 (2022); Trentino et al., 2D Mater. 9, 025011 (2022)[3] Zagler et al., 2D Mater. 7, 045017 (2020)[4] Zagler et al., ArXiv: 2204.09669 (2022)[5] Mirzayev et al., Sci. Adv. 3, e1700176 (2017)[6] Mustonen et al., Adv. Mater., 202106922 (2022) [7] Längle et al., Microsc. Microanal. 26 S2, 1086-1089 (2020)

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Sunstone Bldg / Ground floor / Lab Meeting room I23.EG.005



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