**Single layer templates for molecules: From h-BN Nanomesh to Graphene based Quantum dot arrays**

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The assembly of molecules on surfaces is a central issue for the understanding and exploitation of processes in heterogeneous catalysis, selective gas detection or single molecule electronics. In this keynote I will focus on the role of templates that act as scaffolds for molecular arrays. Such functional nano-templates enable self-assembly of otherwise impossible arrangements of molecules. A particular class of templates is that of sp2 hybridised single layers of boron nitride or carbon (graphene) on metal supports which can be prepared with atomic precision [1] - and they are stable in liquids [2]. If the substrate and the single layer have a lattice mismatch, superstructures with unit cells containing more than 1000 surface atoms may be formed. These superstructures contain sub-units, which behave like single molecule traps [3] or quantum dots [4]. They are an ideal construction lot for supra-molecular architecture where the template function is related to lateral electric fields (dipole rings) on the nanometer scale [3]. For the case of smaller molecules like water it is e.g. shown that new phases assemble on such artificial structures [5].

[1] Comparison of electronic structure and template function of single-layer graphene and a hexagonal boron nitride nanomesh on Ru(0001),
Brugger et al., PRB 79 (2009) 045407.

Widmer et al., Electrochemistry Communications 9 (2007) 2484.

[3] Surface Trapping of Atoms and Molecules with Dipole Rings


[5] Nano-ice on Boron Nitride Nanomesh: Accessing Proton Disorder,