

CPP 18: On-Surface Polymerization (contributed session to SYOP, joint session CPP, MI)

Time: Tuesday 9:30–10:00

Location: C 243

CPP 18.1 Tue 9:30 C 243

Covalent Coupling via Dehalogenation on Ni(111) supported Boron Nitride and Graphene — ●CLAUDIUS MORCHUTT^{1,3}, JONAS BJÖRK², RICO GUTZLER³, and KLAUS KERN^{1,3} — ¹Max Planck Institute for Solid State Research, Heisenbergstrasse 1, 70569 Stuttgart, Germany — ²Department of Physics, Chemistry and Biology, IFM, Linköping University, 58183 Linköping, Sweden — ³Institut de Physique de la Matière Condensée, Ecole Polytechnique Fédérale de Lausanne, 1015 Lausanne, Switzerland

Surface-assisted covalent coupling of organic molecules represents a bottom-up approach for growing defined 2D nanostructures which are promising candidates for a variety of potential applications such as membranes for gas storage/separation, active elements in (opto)electronic devices, and catalysis. Taking a step back from the standard synthesis on (coinage) metal surfaces we explored the polymerization of 1,3,5-tris(4-bromophenyl)benzene via dehalogenation on Ni(111) supported hexagonal boron nitride and graphene by scanning tunneling microscopy and density functional theory calculations. No polymerization is observed on bare Ni, whereas on h-BN/Ni(111) and graphene/Ni(111) molecules debrominate and couple into oligomers after annealing. DFT calculations reveal that both surfaces act as a heterogeneous catalyst and reduce the dehalogenation barrier significantly. They furthermore show a strong interaction between h-BN (graphene) and surface-stabilized radicals, which in turn explains the limited oligomer size as a consequence of a diffusion-limited process.

CPP 18.2 Tue 9:45 C 243

Polymerization of polyelectrolyte poly-L-lysine on charge-patterned silicon wafers — ●HEIDEMARIE SCHMIDT¹, MARTIN MÜLLER², K. WIESENHÜTTER³, B. URBAN², A.-D. MÜLLER⁴, I. SKORUPA^{1,3}, W. SKORUPA³, M. RÜB⁵, and O.G. SCHMIDT^{1,6} — ¹TU Chemnitz — ²IPF Dresden — ³HZDR — ⁴Anfatec Instruments AG — ⁵FH Jena — ⁶IFW Dresden

The local modification of silicon surfaces by adsorbing polyelectrolytes has been predicted to become ubiquitous in the engineering of smart carriers for biosensors, tissue engineering, and directed cell growth [1]. We have implanted phosphorous ions in ca. 200-1000 nm thick layers of a silicon wafer, in order to realize a defined stripe-like microscopic pattern of surface-near electrostatic forces [2]. The estimated density of localized charges between the ca. 2-3 nm thick native silicon dioxide and the silicon wafer ranges from 10^{14} to 10^{18} m⁻² and is much larger and stable than charges from silanol groups at an ordinary silicon dioxide surface. Using combined Atomic and Kelvin probe force microscopy measurements we could show that cationic model polyelectrolyte poly-L-lysine (PLL) [3] with a single chain length of 200 nm is preferentially adsorbed in agglomerates with chain lengths of 1-2 micrometer on the implanted microsized regions of the silicon carrier at pH = 11. The unimplanted regions of the silicon wafer were comparatively weakly adsorbing the PLL. [1] H. Schmidt et al., Appl. Surf. Sci. 281 (2013) 24-29, [2] C. Baumgart et al., Phys. Rev. B. 80 (2009) 085305, [3] Advances in Polymer Science 255 & 256 (Ed.: Martin Müller), Springer, 2014