Towards two-dimensional BNC architectures on metal surfaces from self-assembled monolayers

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Graphene is a two-dimensional material with sp^2-hybridized carbons in a honeycomb arrangement that shows extraordinary properties such as high tensile strength, extraordinary mechanical stiffness, high electron mobility and transparency [1]. However, graphene has no bandgap, which is a limitating factor for using it in electronic devices [2]. Opening of a band gap can be achieved by heteroatom doping. Methods based on molecular self-assembly can lead towards an efficient tailored synthesis of doped graphene for specific applications, depending on the molecular precursor. Here we aim to synthesize doped graphene using borazine derivatives (introducing a boron-nitrogen ring in the place of an aromatic carbon cyclic) [3]. The molecular precursor containing isolated boron-nitrogen rings is deposited on a Cu substrate by self-assembly, then the self-assembled monolayer is polymerized by using UV light to prevent sublimation when thermally converting them into a (doped) graphene layer. Here we show the first results by X-ray photoelectron spectroscy (XPS) and describe the difficulties encountered in realizing a specific doping depending on the precursor and in developing 2D boron-nitrogen-carbon materials with reproducible and fine-tuned properties for optoelectronic devices.

References:

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