On-Surface Synthesis of Higher Acenes and Nanographenes

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In recent years we observe increasing interest in the atomically precise synthesis of single molecules. Among different families of species, acenes and nanographenes hold the special position. In particular a lot of effort is undertaken to achieve efficient synthetic strategies to generate such well-defined sections of graphene or graphene-like modules with diverse topological modifications. However, the reactivity/instability of numerous molecules as well as the insolubility of large polycyclic aromatic hydrocarbons limits the applications of conventional chemistry methods. An attractive alternative to the solution chemistry is based on its combination with the on-surface synthesis approach.

Higher acenes are attracting considerable interest due to the predicted intriguing electronic properties. However, the instability quickly growing with the number of annulated rings makes their synthesis, detailed characterization and functionalization a very challenging task. Recently the on-surface chemistry approach has proven to provide the powerful pathway for the generation of the longest members of their family synthesised so far. Herein we present the on-surface generation of higher acenes (Fig. 1) as well as the detailed study of their electronic structure on the Au(111) surface [1-2].

While the surface assisted synthesis approach has proven its effectiveness in the precise formation of new organic compounds one of the most challenging limitations arises from the deep dependence on the catalytic activity of the substrate. This makes the direct transfer to the technologically desired non-metallic surfaces extremely challenging. In this talk we present our pathway for the synthesis of new molecular compounds on non-metallic surfaces [3-6] with prospects for circumventing the need to exploit the catalytic role of metallic surfaces.

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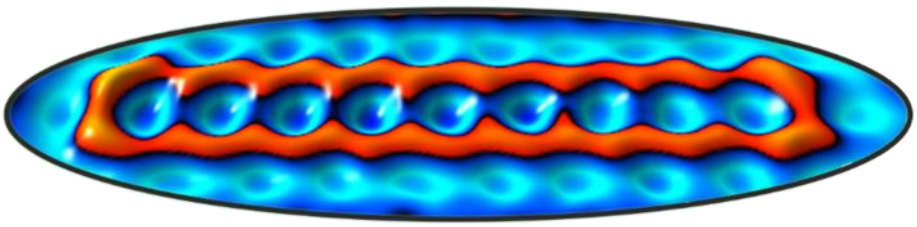

Fig. 1. Non-contact atomic force microscopy image of nonacene on Au(111) [1].

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