Single molecule conductance and metal surfaces self-assembly of helicenes

Narcis Avarvari[1]

[1]*MOLTECH Anjou, CNRS – University of Angers, Angers, France*

*Corresponding author: narcis.avarvari@univ-angers.fr

On-surface chemistry has become a popular synthesis strategy to achieve new functional materials and interfaces that are hardly available by solution chemistry. Prominent examples are graphene nanoribbons, nanographenes and macrocycles [1]. Such systems are usually obtained by *in-vacuo* deposition of aromatic precursors onto metal surfaces followed by thermally induced C−C coupling. Helicenes represent a very important class of aromatic compounds endowed with molecular helical chirality resulting from the *ortho*-condensation of aromatic rings along a helical axis [2]. From a general perspective, chiral materials [3] are gaining continuous interest in the frame of chirality related physical phenomena such as the chirality induced spin selectivity (CISS) effect. CISS refers to the selective transmission of a preferential electron spin orientation through a chiral material [4]. The straightforward access to bis- or tris-helicenes with specific configurations is therefore particularly interesting, but generally challenging when starting from racemic mixtures of precursors, yet the on-surface chemistry offers such synthetic control in the Ullmann coupling of bromo-helicenes, as we have shown for bis- and tris-tetrahelicenes [5,6], and, more recently, for bis-hexahelicenes [7].The self-assembly of benzene-1,3,5-tris(tetrahelicene) on Ag(111) surface resulted in a dense packing achieved through a chiral triangular tiling of triads, with N and N±1 molecules at the edges. The triangles feature a random distribution of mirror-isomers, with a significant excess of one isomer. Chirality at the domain boundaries causes a lateral shift, producing three distinct topological defects where six triangles converge. These defects partially contribute to the formation of supramolecular spirals. Despite the potential for regular patterns, all observed tiling was aperiodic [8].

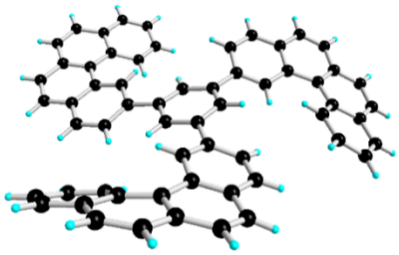

Fig.1. Benzene-1,3,5-tetrahelicene.

We will also discuss in this contribution evidences for the occurrence of the CISS effect in [6]helicene-bis(thiol) through single molecule break junction [9].

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