Chirality-dependent planarization of helicenes via on-surface cyclodehydrogenation - Stm study

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The subject of our research is chiral crystallization of carbohelicenes into homochiral structures. 2D chiral crystallization of carbohelicenes on metal surfaces is of paramount importance for light sensors or for electron-spin filters. Here, we report the 2D chiral crystallization of *2,2*’-bispentahelicene on Au(111) and its thermal-induced dehydrogenation studied with scanning tunneling microscopy (STM). The low coverage deposition of bis[5]helicenes on Au(111) kept at 400 K, leads to formation of heterochiral zigzag chains of the (*M,M*)- and (*P,P*)-enantiomers growing along the herringbone reconstruction pattern. In the closed-packed monolayer, both enantiomers self-assemble into racemic phase and rotational and mirror domains can be differentiated. Due to its strong sterical overcrowding in its adsorbate state, the (*P,M*)-meso form was not observed on the surface.

Upon annealing the substrate to approximately 670 K and subsequent cooling to 50 K, the characteristic twisted shape of the bis[5]helicenes with protrusions is no longer observed and two-dimensional homochiral domains of planar coronocoronene molecular species can be distinguished. The transformation from helical to planar chiral molecules via dehydrogenation and loss of eight hydrogen atomes was confirmed by secondary ion mass spectrometry (ToF-SIMS). Further STM measurements at 7 K affirmed the formation of mirror and rotational 2D homochiral conglomerate domains of *Sp*- and *Rp*-coronocoronene.