Two-dimensional supramolecular networks formed by intermolecular interdigitation

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Chirality on surfaces has been achieved in a variety of ways [1]. Chiral molecules can be directly adsorbed, preserving their chirality on surfaces. The deposition of achiral molecules can also lead to chiral surfaces, directly upon adsorption or by change in the environment, i.e. electric field, additional molecules, metal coordination etc. [2,3,4].

Here we studied two molecular networks of electrospray deposited molecules on Au(111) surface using noncontact AFM and STM at room temperature and low temperature. The networks are formed by a hexabenzocoronene (HBC) based molecule [5] and a shape-persistent spoked wheel (SW) molecule [6] equipped with alkyl side chains. Thermal expansion phenomenon is observed for the two networks. Using additional MD calculation, we show the influence of the alkyl chain mobility on the network expansion [7].

In parallel we observed how temperature can impact the chirality of these molecular networks on surfaces. Both networks show no chirality at room temperature on Au(111). Upon cooling down chirality can be observed in the HBC network. Additionally, the SW molecule forms chiral networks at room temperature when adsorbed on the KBr(001) surface. Our results show the possibility to influence chiral properties of large molecular assemblies by temperature change.

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