Molecular mobility on a silicon surface: Towards a directional sliding on a runway at Room Temperature

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Design of working nanovehicules is a key challenge for the development of new devices. In this context, 1D controlled sliding of molecules [1,4-di-(9-ethynyltriptycene)benzene molecule (DETB) built around a 1,4-diethynylbenzene axle with both sides equipped with a triptycene wheel] on silicon-based surface is successfully achieved by using an optimized molecule-substrate pair. Even though molecule and surface are compatible, molecule-substrate interaction provides 1D template effect[1] to guide molecular sliding along a preferential surface orientation. Molecular motion is monitored by STM experiments under ultra-high vacuum at room temperature. Molecule-surface interactions are elucidated by semi-empirical calculations.[2]

With the ability to adjust the geometric parameters of the surface to those of the target molecule, it is now possible to promote its directional movement. This strategy should enable the development of nanodevices to transport matter or information at the molecular level on semiconductor surfaces.

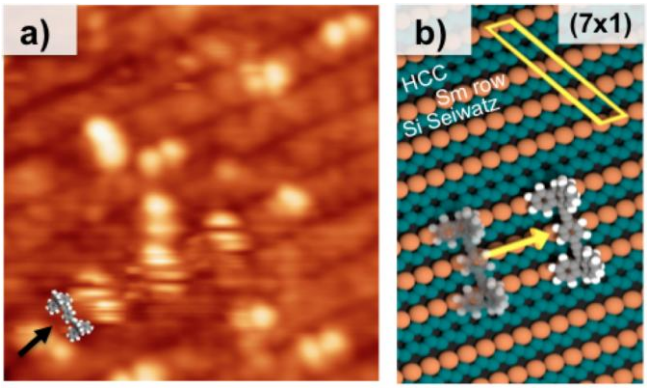

Fig. 1 a) STM image of DETB molecules on SmSi(111)-7×1 at low DETB coverage. When DETB molecules are adsorbed with their main axis perpendicular to the surface [110] direction, a shifting along this direction is highlighted with a black arrow. b) Model of DETB sliding observed in a).

[1] Y. Makoudi, E. Duverger, M. Arab, F. Chérioux, F. Ample, G. Rapenne, X. Bouju, F. Palmino, *ChemPhysChem* **2008**, *9*, 1437 (2008).
[2] X. Bouju, F. Chérioux, S. Coget, G. Rapenne, F. Palmino, *Nanoscale* **2013**, in press.