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Exclusively Linear Diffusion of 9,10-Dithioanthracene on an Isotropic Cu(111) Surface KI-YOUNG KWON, University California, Riverside, ROBERT PERRY, GREG PAWIN, ERICK ULIN-AVILA, KIN WONG, LUDWIG BARTELS — One-dimensional diffusion of adsorbates is a common feature of anisotropic surfaces such as the (110) and (211) cuts of an fcc crystal. The technologically-relevant lowest energy (111) surfaces of coinage metals have six-fold symmetry in the top layer and, hence, generally allow diffusion of adsorbates along more than one direction. Here, we report on the diffusion of individual 9,10-dithioanthracene (DTA) molecules on Cu(111). DTA adsorbs with the aromatic system lying flat on the substrate and with both sulfur atoms anchored at hollow sites of the substrate. In variable-temperature STM studies, we find that it diffuses exclusively in the direction in which it aromatic moiety happened to adsorb. We neither find rotation of the molecule in the surface plane nor diffusion perpendicular to the aromatic axis of the molecule. We investigated the dynamics of the one-dimensional diffusion of DTA and find an energy barrier of 114 meV. DTA molecules form well-ordered molecular rows. By temperature dependent measurements of the spontaneous abstraction of DTA molecules from such row, we could determine that the intermolecular attraction is 40 meV in addition to the diffusion barrier of the isolated molecule. At higher coverage, DTA forms square islands of (3,-1,3,4) symmetry on Cu(111).

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