

Surface Strain Mediated Dipole Alignment of CIAIPc on Au(111)/mica

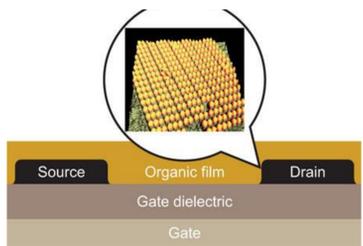


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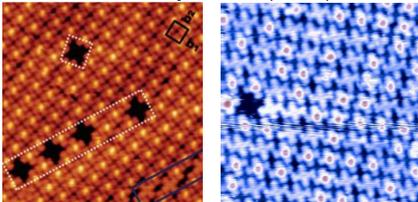
Introduction



Scheme of an organic FET.

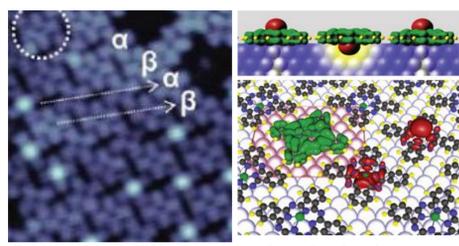
TCNQ on Cu, organic/metal electrode interface.

Nature Chemistry 2, 344 (2010)



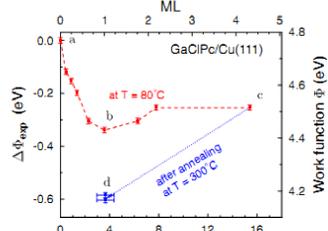
Monolayer CIAIPc on Au(111) and Ag(111) Coverage-dependent work function of GaClPc on Cu(111)

Phys. Rev. B, 87, 085205, (2013)



Substrate Effects on the Order/disorder Packing

Nature Physics 5, 153 (2009)



Phys. Rev. Lett, 106, 156102 (2012)

Results and Discussion

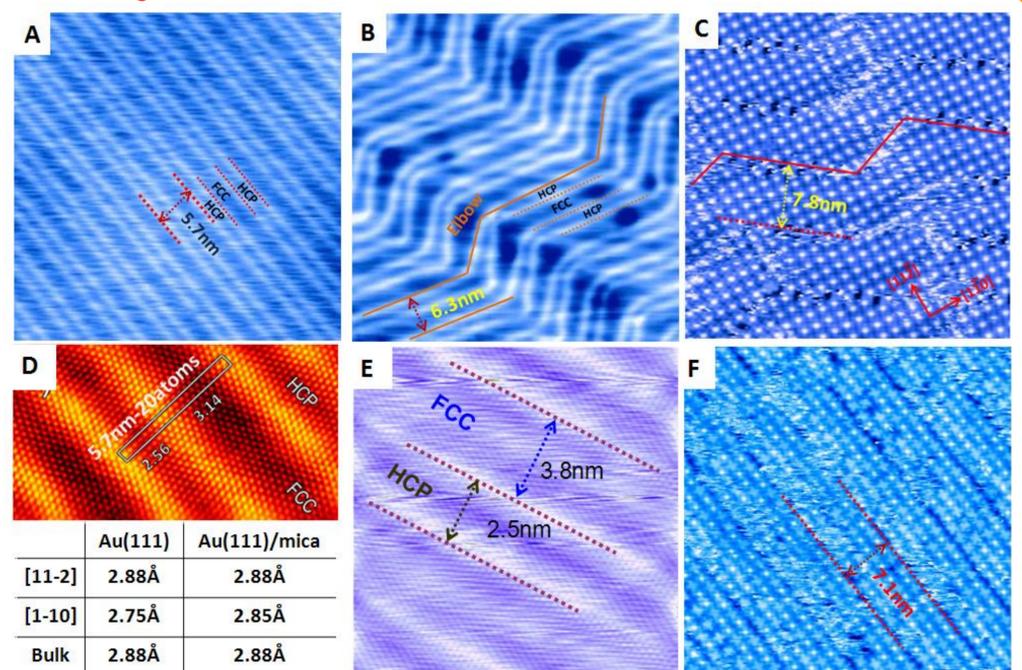
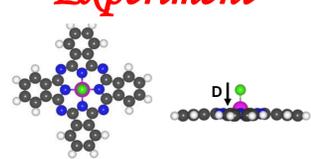


Figure 1. (A) Unidirectional reconstruction of Au(111) on mica; (B) herringbone reconstruction of Au(111) single crystal; (C) ~0.9 ML CIAIPc molecules on the Au(111) single crystal; atomically resolved STM image of the FCC and HCP region on Au(111)/mica (D) and Au(111) single crystal (E); The linear packing structure of CIAIPc along the stripes of the Au(111)/mica reconstruction.

Experiment

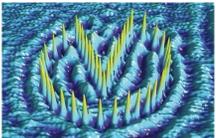


Non-planar Dipole-Phthalocyanine Chloride Aluminum Pc (CIAIPc)

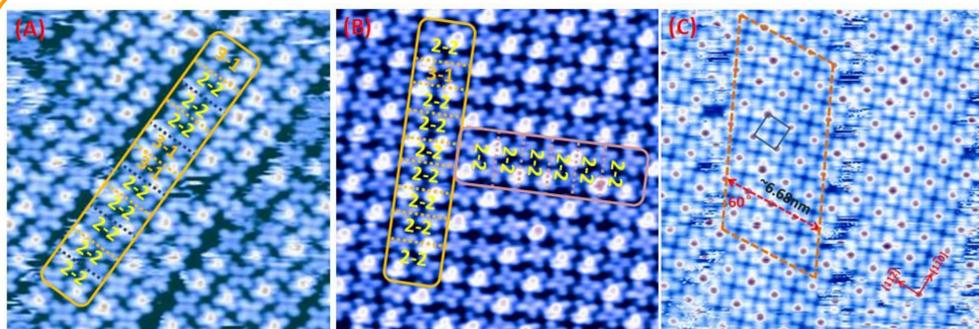
Organic molecular beam epitaxial (OMBE) Characterized by STM

Ultra-high vacuum low temperature scanning tunneling microscopy

UHV-LT-STM



Conclusion



CIAIPc	Au(111)/mica 0.6ML	Au(111)/mica 0.9ML	Au(111) Single Crystal 0.9ML
Cl-up	~60%	~50%	~99%
Cl-down	~40%	~50%	~1%
Up-down 0-4	0	0	0
1-3	0	0.2%	0
2-2	~71%	~91%	0
3-1	~29%	~8.8%	0.3%
4-0	0	0	99.7%

Figure 3. The molecular ordering and dipole ordering of CIAIPc on Au(111)/mica and the Au(111) single crystal surface. The dipole alignment within each unit cell (four neighboring CIAIPc molecules) on different surface; and under different coverage is summarized.

□ 1.74% increase of lattice constant along [1-10] comparing with the herringbone reconstructed Au(111)

□ where intermolecular repulsion will be caused for identically aligned CIAIPc on Au(111)/mica;

□ Unique local ordering of dipole alignment comprising of one Cl-up and one Cl-down CIAIPc within one unit cell minimized the repulsion dramatically and stabilized the superstructure

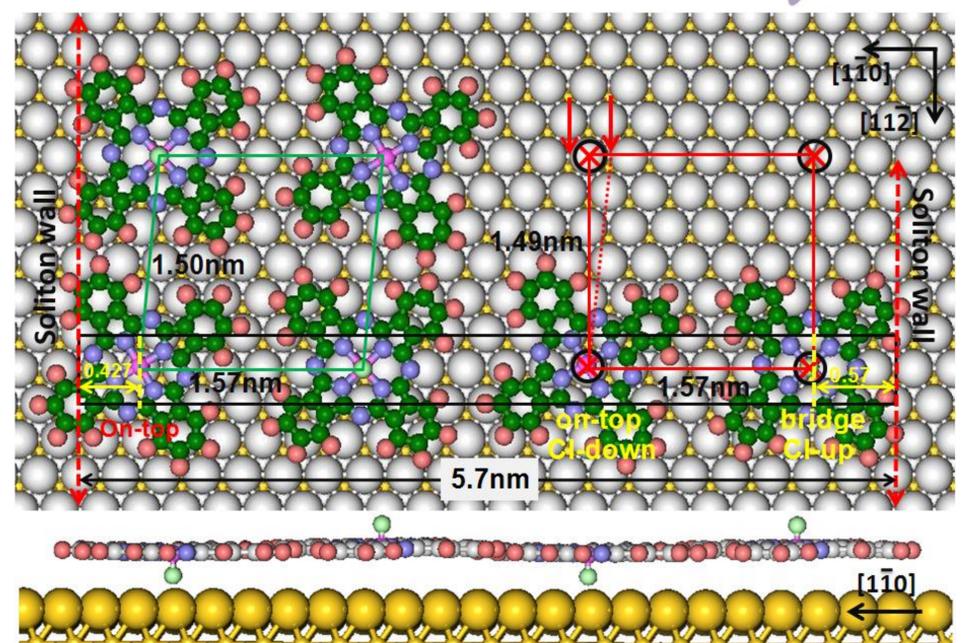
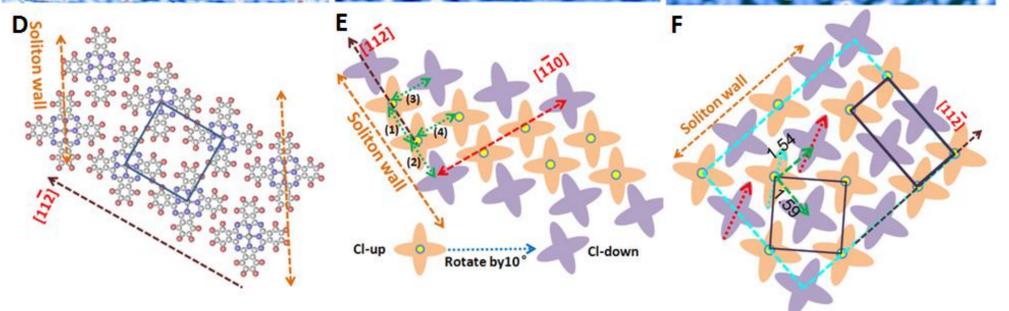
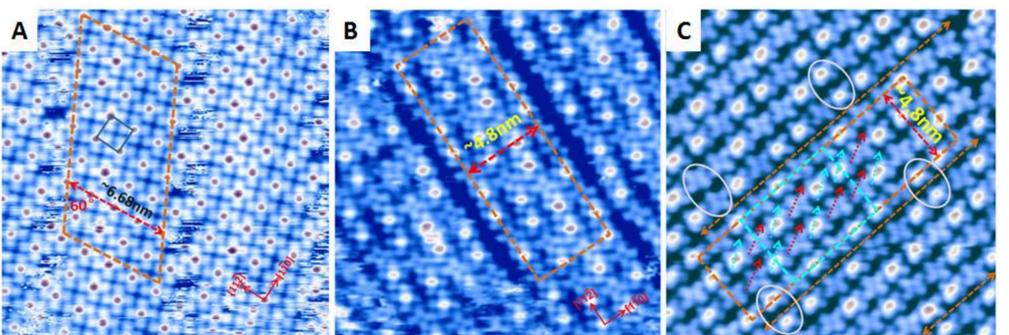


Figure 2. (A) Molecularly resolved STM image of CIAIPc on Au(111) single crystal, the VOPc molecules adopt unidirectional Cl-up orientation; (B) ~0.5 ML CIAIPc on the Au(111)/mica surface, four-row stripes are formed within which the CIAIPc alternatively orientated with Cl-up and Cl-down configurations; (C) ~1ML CIAIPc molecules on Au(111)/mica surface, an alternative packing within the four-rows is preserved; their corresponding packing structure is demonstrated below in (D), (E) and (F) respectively; The proposed model of the formation of the four-row molecular stripes within one unit cell of the Au(111)/mica is proposed below, which indicates the epitaxial adsorption.

Acknowledgement

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