

課題: 色素増感太陽電池モデル基板上において吸着色素分子を特定可能か?

実験結果 2次元エネルギー散逸分布像に色素吸着分子のコントラストが強く現れる。
複数の分子が混在したときに分子識別が実現される可能性がある。

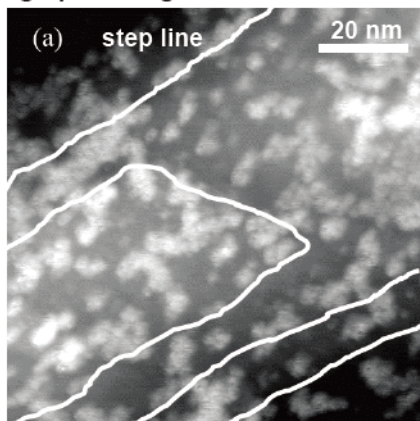
Mechanism of DSC (Dye-Sensitized Solar Cell)

1. Electrons are photo-excited
2. Electrons are injected into the conduction band of TiO₂
3. Electrons run through the circuit and reach anode.
4. I₃⁻ receives the electrons in the anode

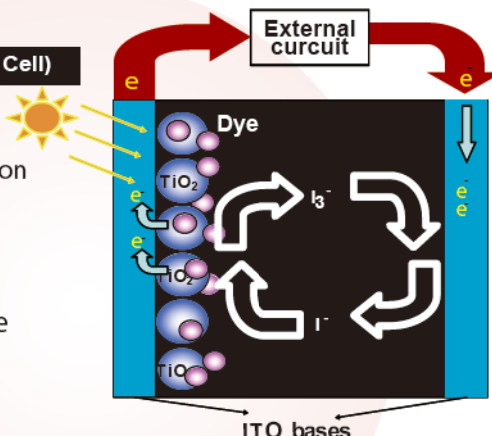
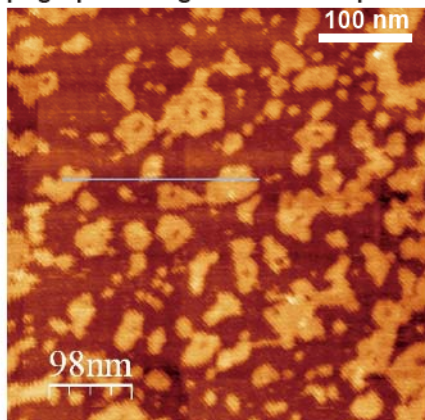
Sample preparation

1. repeated Ar ion sputtering and vacuum annealing to prepare clean surface
2. covered with TMA monolayer
3. immersed in an acetonitrile solution of BD (5μM) in air
4. observation by FM-AFM

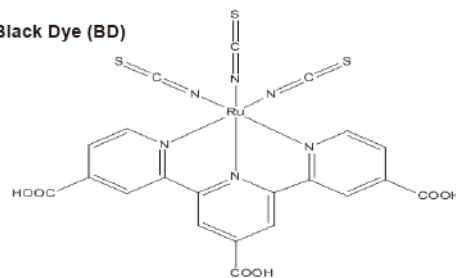
Topographic Image in UHV



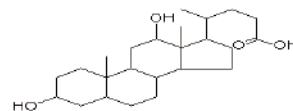
Topographic Image in 1M KCl aqueous water (TiO₂(110) surface without BD)



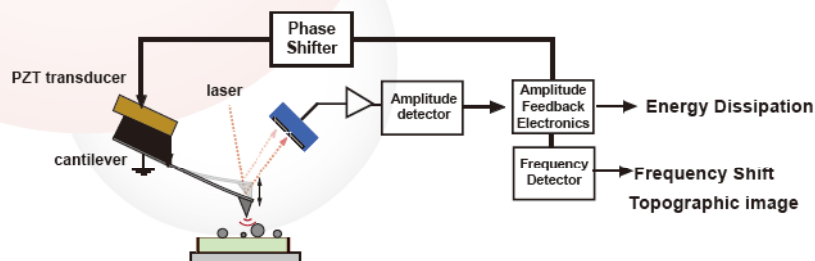
Black Dye (BD)



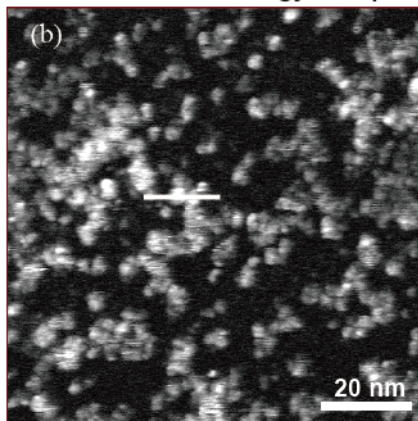
,Deoxycholic acid(DCA)



Setup for FM-AFM



lateral distribution of energy dissipation



Sample bias voltage: +0.3 V.
Cantilever oscillation frequency: 352 kHz.
Cantilever oscillation amplitude: 6 nm.
Frequency shift : -160 Hz
Imaged In UHV

Mechanical energy of cantilever vibration was dissipated (15 fW) on BD molecules

In UHV

In LIQUID



Hydration layer is visualized in liquid.

Photo-reaction have serious effect on surface charge density.

