

Reversible Switching of the Au (111) Work Function by Near Infrared Irradiation with a Bistable SAM Based on a Radical Donor-Acceptor Dyad

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Organic radicals have gain attention in the last years, the open-shell configuration makes most of them to be unstable and highly reactive, but nowadays it has been synthesized organic stable radicals that present very interesting properties such as optical, electrical and magnetically, which are not achieved with the close-shell configuration. In particular, Polychlorotriphenylmethyl (PTM) radicals are very stable due to the chlorines present on the benzene rings, which makes the radical to be protected by steric hindrance presenting interesting properties. [1] To use these molecules for different applications is necessary to find a way to structure them in a more manageable configuration, such as, self-assembled monolayers or nanoparticles.

In this work we describe the formation of a Self-Assembled Monolayer (SAM) of a Donor-Acceptor (D-A) system based on a PTM radical derivative (Fc-PTM) on Au (111) with interesting electronic properties. Kelvin Probe Force Microscopy (KPFM) has been used to measure the CPD and it has been observed that it is possible to tune the work function (WF) of gold when functionalizing the surface with this D- A molecule, which may have interesting applications for transistors or diodes.[2-4] More recently, it has been found that the ferrocene moiety behaves as an electron donor, conferring a partial internal electron transfer to the PTM, which it is possible to be controlled by a low energetic external stimulus like Infrared (IR) light. Consequently, the WF of the functionalized gold surface is significantly shifted by +250 mV, one of the highest values reported in the literature and the first one achieved irradiating in the IR region. [5]

The results here reported demonstrate that SAMs based on spin based D-A dyads showing ICT can be used for obtaining SAMs with photo switchable work functions due to its spin character. These peculiarities strongly open the application of D-A spin based SAMs showing intramolecular charge transfer to control the charge injection in organic/metal interfaces.

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FIGURES

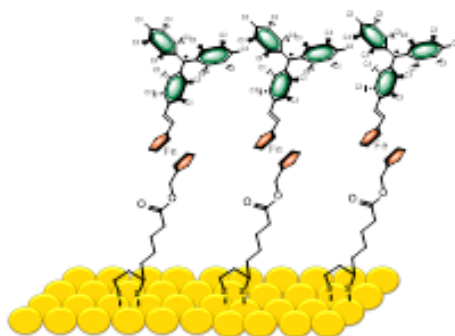


Figure 1: Self-Assemble Monolater of Fc-PTM radical molecules on Au (111).

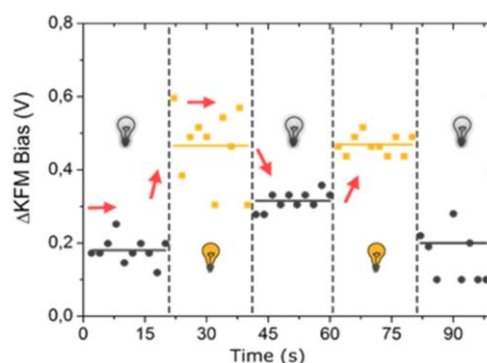


Figure 2: Shift of Fc-PTM functionalized Au (111) WF under IR switch pulses