Towards Molecular Printboards with Improved Electrical Contact

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Abstract Self-assembly at solid substrates constitutes an important strategy to tune the interfacial properties of a range of materials[1]. Chemical manipulation of the building blocks can be used to drive the assembly process and consequently gain control over the resulting properties, which is essential in the development of molecular electronics[2]. In this sense, the immobilization of host molecules is highly appealing since selective and precise but reversible positioning of guests is possible. β-Cyclodextrin (β-CD)-based molecular printboards have been prepared by functionalization of the primary rim with long alkyl-sulfide chains that mimic the assembly behavior of alkanethiols[3], yielding densely packed monolayers exposing the β-CD moiety at the surface. However their potential use in applications where the electron transfer to or from the electrode is required is limited because the thick alkyl layer restricts electron transfer.

Here we report an alternative strategy for promoting self-assembly based on the incorporation of weak gold-binding functional groups directly on the primary rim of the β-CD core, taking advantage of the directional, multivalent exposure of the anchoring groups to increase the affinity and stability of the interaction. The assembly of these adsorbates has been characterized by contact angle goniometry, surface plasmon resonance (SPR), polarization modulation infrared reflection adsorption spectroscopy (PM-IRRAS), X-ray photoelectron spectroscopy (XPS) and electrochemistry, strongly supporting the presence of these compounds at the surface. The role of the anchoring group demonstrated a strong influence on the adsorption kinetics, film thickness and order of the resulting monolayers.

References

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Figures