INVESTIGATION OF ELECTRON PATHWAYS IN ALKANETHIOL JUNCTIONS BY CONDUCTIVE SCANNING FORCE MICROSCOPY

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There is an enormous interest in understanding how electrons flow through organic matter, issue of paramount importance in the fields of materials science and biology. This has triggered numerous experimental approaches to sandwich molecules between two metal surfaces in order measure the transport through the molecular device.[1] Alkanethiols have been chosen as archetypical molecular systems to clarify the charge transport mechanisms at the molecular scale. However, no conclusive picture has emerged yet due to the difficulty of isolating a single contribution, which for example requires varying the film thickness while keeping constant the molecular length. The common approach employed is to compress the alkanethiol film to induce molecular tilting.[2-4] But this compression can produce not only chain tilting but also conformational defects on the molecules forming the monolayer that can affect the measured current.[5]

Our ability to obtain differently tilted configurations for the same molecular length offers the opportunity to address the role played by the chain length and the molecular tilt on the transport properties of these types of monolayers.[6] Our films exhibit excellent molecular order which is crucial to obtain reproducible results. We have taken advantages of the versatility of the scanning force microscopy (SFM) technique to perform this study, since the use of a conductive tip provides a straightforward and controlled manner of contacting the organic layer.

We show that two tunnel pathways have to be considered to reproduce the experimental measurements. In this work we prove that the relative importance of both pathways varies depending on the molecular length.

Referencias:

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