Conformational Effect on Electrical Conduction in a Single Alkyl Chain

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Tunnelling currents through alkyl chains sandwiched between two electrodes have been measured by a variety of different experimental approaches. The electrode-molecule-electrode junctions have been developed using Au-Au, Hg-Hg, Hg-Ag electrodes as well as scanning probe microscopy (SPM) such as scanning tunnelling microscopy (STM) [1] and atomic force microscopy (AFM) [2]. STM and AFM can make contacts between the molecule and metals that are crucial for quantitative measurements of the tunnelling currents through molecules of interest. In this case, it is recognised that the measured conductance strongly depends on the bonding of the molecule to the electrodes.

In our previous experiments, we investigated the structural effect of the hydrocarbon moieties on the electrical conduction [3]. The result shows that all-*trans* conformation leads to higher conductance compared to *gauche* conformations. According to this result, for charge transport through alkyl chains, the molecular conformation can be as important as the metal-electrodes contacts.

In this study, we investigated the conformational effect on electrical conduction in a single alkyl chain using self-assembling techniques and SPM.

References:

[1] B. Xu, N. J. Tao, *Science,* **301** (2003) 1221.
[2] X. D. Cui, A. Primak, X. Zarate, J. Tomfohr, O. F. Sankey, A. L. Moore, T. A. Moor, D. Gust, L. A. Nagahara, S. M. Lindsay, *J. Phys. Chem. B*, **106** (2002) 8609.
[3] M. Suzuki, S. Fujii, S. Wakamatsu, U. Akiba, and M. Fujihira, *Nanotechnology,* **15** (2004) 150.