Reliable anchoring groups for single-molecule junctions

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The transport properties study of a single molecule locked between two metallic electrodes is an essential starting point to develop molecular electronics. Thiols have been extensively used as the most common anchoring groups to bind molecules to gold electrodes, as the covalent sulfur-gold bond is strong [1]. However, other anchoring groups can provide interesting advantages. Amines have been a frequent second choice as they are reported to produce molecular junctions with less scattered (although slightly lower) conductance values than thiols [2]. Recently, C60 has been also proposed as a possible very efficient binding group of molecules to gold [3].

In this talk, I will present our studies on molecular junctions formed by thiol-, amine- and C60-terminated molecules. We use a STM (scanning tunneling microscope) break-junction technique to create and characterized single-molecule junctions both in ambient and liquid environment. In addition to summarize their electrical signals in conductance histograms [4,5], we extract extra information from a detailed statistic study of the molecular-junction electrical signature length. These studies provide us with new relevant information on the molecular-junction formation, and exhibit interesting advantages of using C60 as anchoring group.

References