# NANO HIGHLIGHT
# Molecule-Electrode Contacts: Stability and Binding Strength

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A basic requirement in molecular electronics is to wire a single molecule to two macroscopic electrodes[1]. The interfaces between the molecule and the electrodes is known to play an important role in the electron transport through the molecule, and even mask electronic signature of molecules[2]. A widely used contact method is to use molecules terminated with thiols so that they can form covalent bonds with gold electrodes.

We have used a conducting AFM (CAFM) to create single molecular contacts and measure their binding strengths (Fig. 1A) [3]. The breakdown of individual Au-alkanedithiol-Au contacts is measured as abrupt drops in the measured force and conductance (Fig. 1B). The bond strength is found to increase linearly with the logarithm of the loading rate, and then reach a plateau, which indicates a thermally-activated dissociation of molecular contacts. The average lifetime of a Au-alkanedithiol-Au contact is estimated to be less than a few seconds**.** This finding suggests that metal-thiolate bonds may not be the best choice for connecting molecules to macroscopic electrodes. Silicide is a promising electrode material for molecular contacts, due to its metal-like conductivity[4] and prospective formation of Si-C covalent bonds as molecular clips. Using hydrosilylation modification, we have been forming molecule-electrode contacts via Si-C bonds and study the bonding stability and strength.

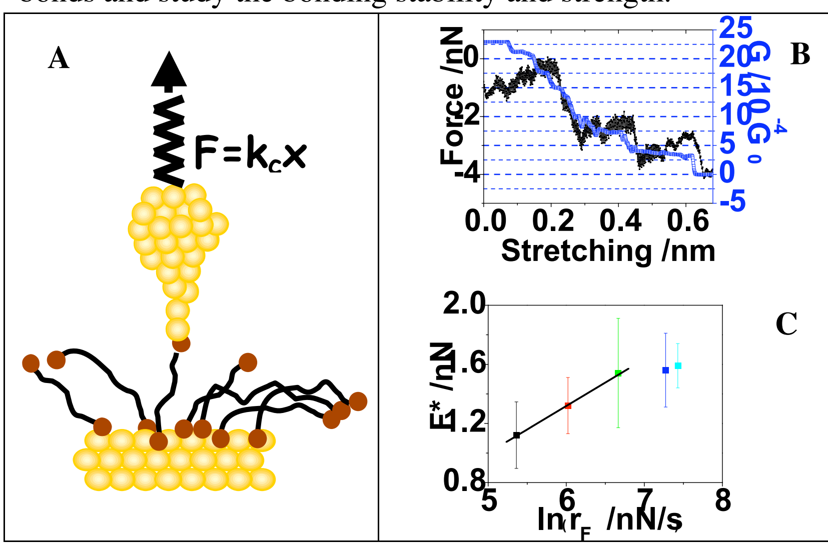


Fig 1. (A) Scheme of single Au-S-$(CH_2)_8$-S-Au contacts created by CAFM. (B) Simultaneously recorded force and conductance of Au-S-$(CH_2)_8$-S-Au contacts. (C) Bond strength of Au-S-$(CH_2)_8$-S-Au contacts as a function of loading rate.

**References**

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