University of Maryland NSF-MRSEC Highlight:

Metal Electrodes Fluctuate under Molecular Bonds

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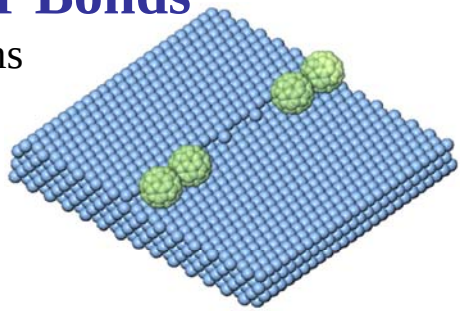
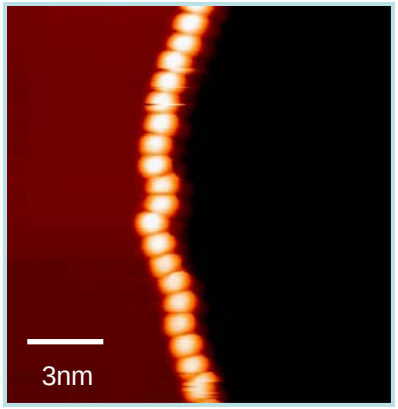
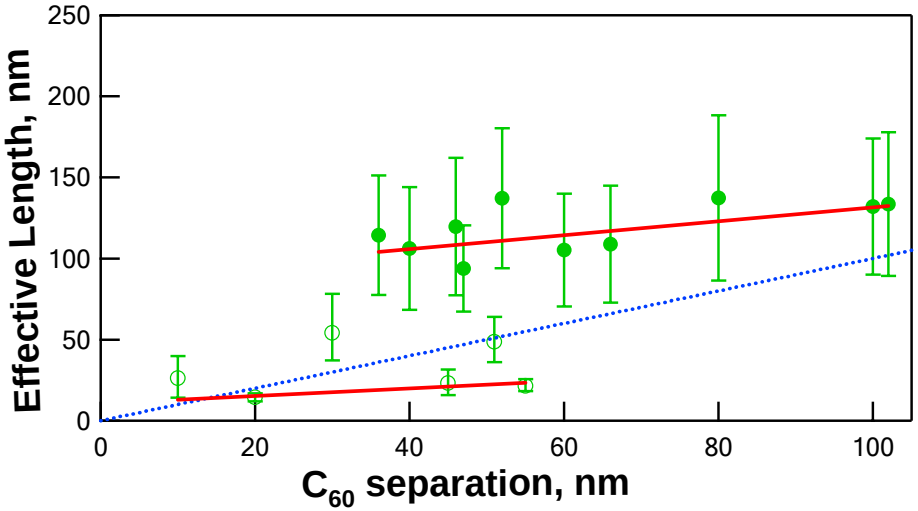


Metal-molecule contacts play a key role in defining electron transport in molecular electronics. However, the possibility of structural motion, e.g wandering atoms on the metal electrode, may lead to stochastic behavior in the "device" properties. A model system to investigate this issue is provided by the strong bonding of C60 molecules to step edges on a Ag surface. When free, the step edges move dynamically at room temperature via hopping of atoms along the step edge. If C_{60} bonding restricted atomic motion, it would limit the effective length of the step to the distance between C_{60} molecules. By fabricating step configurations with different C_{60} separations, we show that there is no variation in the effective length, thus Ag atoms continue to fluctuate in position, despite the presence of the bound molecules.





Evolution of structure

Above: Scale drawing and STM image of C_{60} molecules bound to a step edge on Ag(111).

Left: Measured effective length of the fluctuating step shows no significant variation with the separation between C60 molecules bound to the step. Hindered atomic motion would have yielded the dependence shown as the blue line.