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Analysis of Self-Assembled Monolayers in Nanoscale Switching Elements MATTHEW ROBERSON, LAM YU, University of Memphis — Molecular junctions consisting of gold and silver electrodes and a self-assembled monolayer (SAM) have been shown to act as voltage-controlled electrical two-state switches due to the electrochemical migration of silver ions. In these junctions the SAM is sandwiched between the two metal electrodes. When a certain bias voltage is applied across the metal electrodes, atoms on the silver electrode surface are electrochemically oxidized, and the resulting silver ions are drawn by the local electric field toward the gold electrode. Upon deposition onto the gold electrode the silver ions are reduced to silver atoms. As more silver atoms are deposited onto the gold electrode, a metallic connection is formed between the electrodes resulting in a closed-circuit state between the two electrodes. The silver metallic bridges are metastable in these junctions, and they are dissolved when the voltage between the electrodes is swept back toward zero volts. When the silver filaments retract, the switch returns to an open-circuit state. Varying the functional group of the SAMs induces different switching characteristics in the junctions. We are analyzing the transition voltages at which this switching occurs for different SAMs under different temperature and humidity, and plotting the data to observe trends in order to isolate the key factors involved in this switching.

Matthew Roberson
University of Memphis

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