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Fabrication of Nanoscale Devices by Electromigration SWATILEKHA SAHA, GUOGUANG QIAN, K.M LEWIS, Rensselaer Polytechnic Institute (RPI) — Currently, transport properties through nanostructures are of considerable importance due to the increased demand for nanometer sized electronic devices. One of the main challenges is to create electrodes with nanometer sized separation, where nanoparticles or molecules can be incorporated. Electromigration has proved to be a consistent method for creating gaps of such dimension. Here, we have fabricated gold (Au) nanowires of thickness 25-50 nm and length 200 nm by e-beam lithography. Then Au nanoparticles or Fe porphyrin molecules is deposited on the wires and a gap of size <10 nm is formed by electromigration. This results in confinement of the Au nanoparticles or porphyrin molecules in the gap. When Au nanoparticles are used, it is found that the resistance of the sample decreases by a factor of 10 and the I-V behavior is ohmic. By functionalizing the Au nanoparticles, the sample can then be used as a chemical sensor operable at room temperature. Experiments will be proposed to study transport through Fe porphyrin molecule at 4K to observe Coulomb blockade, which has applications as switches in molecular electronic devices.

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