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Towards molecular electronics with scalable nanopore junctions[1]
ALEX NEUHAUSEN, Department of Electrical Engineering, Stanford University, DAVID GOLDHABER-GORDON, Department of Physics, Stanford University, CHRIS CHIDSEY, Department of Chemistry, Stanford University — We have fabricated and measured nanoscale molecular junctions. Each device consists of a shallow pore in an oxide layer, with a self-assembled monolayer (SAM) on a gold surface at the bottom. The use of a conductive polymer as a top-contact avoids previously noted issues of metal diffusion into contacted SAMs. Larger pores are more likely to contain monolayer defects and dislocations, thus nanometer-scale control over the pore size allows us to investigate transport through the SAM as a function of defect density. The planar geometry and use of robust materials in the device allows for additional molecular synthesis after monolayer formation. For example, we use "click" chemistry to alter the functionality of SAMs of azide-terminated alkanethiols. The use of mixed monolayers to substantially dilute the number of conducting molecules in a 50-nanometer diameter pore allows us to observe few to single-molecule transport behavior.

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