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Scanned Probe Imaging of Nanoscale Conducting Channels in Pt/alkanoic acid monolayer/Ti Devices CHUN NING LAU, University of California, Riverside, DUNCAN R. STEWART, Hewlett-Parkard Laboratories, MARC BOCKRATH, Caltech, R. STANLEY WILLIAMS, Hewlett-Parkard Laboratories — The mechanisms responsible for switching in metal/molecule/metal systems are subjects of intense research. We report here a scanned probe technique that maps the conductance of a planar molecular junction (Pt/stearic acid monolayer/Ti) under mechanical perturbation by using an atomic force microscope (AFM) to apply a localized force to a molecular junction while measuring the junction conductance. Such mechano-conductance maps reveal that transport through the molecular device is dominated by nanoscale conducting channels, which emerged or disappeared when the junction is switched into higher or lower conductance states. The experimental conductance data across a wide range of device conductance are consistent with the formation of nanoscale quantum point contacts, and can be effectively described by a quantitative model that combines quantum tunneling with the growth of nano-asperities.

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