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Quantum Channels and Conductance Oscillations in TiOx Nanoswitches FENG MIAO, Department of Physics and Astronomy, University of California, Riverside, J. JOSHUA YANG, DUNCAN R. STEWART, R. STANLEY WILLIAMS, HP labs, Palo Alto, CHUN NING LAU, Department of Physics and Astronomy, University of California, Riverside — We investigate conductance switching in Pt/TiOx/Pt devices by pressure-modulated conductance microscopy. For devices with conductance G>>G_Q and G<< G_Q, where G_Q is the conductance quantum, localized pressure-induced conductance peaks are observed, indicating formation of nanoscale conductance pathways on the electrodes. We postulate that these nanoconducting channels are related to the drift of oxygen vacancies under electrical field. For devices with G$\sim$ 1- 2 G_Q, in addition of conductance peaks, we also observed conductance dips and oscillations in response to localized pressure. These results suggest formation of quantum conductance channels in our devices, and can be modeled by considering interfering electron waves between two partially transmitting electrodes. Our findings suggest the possible use of these devices as atomic-scale switches.

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