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Scanning Probe Microscopy of Semiconducting Nanowires[1] A.C. BLESZYNSKI, R.M. WESTERVELT, Dept. of Physics, Harvard University, F.A. ZWANENBURG, L.P. KOUWENHOVEN, Kavli Institute of Nanoscience, Delft University of Technology, A.L. ROEST, E.P.A.M BAKKERS, Philips Research Laboratories — We have used a liquid-He cooled scanning probe microscope (SPM) with a conducting tip to image electrical conduction through InAs nanowires. The charged SPM tip is scanned above the nanowire and the resulting change in nanowire conductance is recorded to form the image. These conductance images are used to study the behavior of electrons in the nanowire on a local scale. For example, the images reveal barriers to conduction at the contacts as well as sections of the wire that act as quantum dots. At 4K the wires exhibit Coulomb blockade oscillations in conductance versus backgate voltage that are indicative of multiple quantum dots in series. The images reveal the location of the quantum dots along the wire and the tip voltage can tune their charge state. The nanowires, grown catalytically from small gold particles, have diameters between 50 and 100 nm. Ti/Al source and drain contacts with a spacing of 1 to 2 μm were defined using e-beam lithography.

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