MAR07-2006-004434

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

Electron transport through STM-patterned dopants in silicon[1]

MICHELLE SIMMONS, University of New South Wales

The recent adaptation of scanning probe systems for nanoscale device fabrication has opened the door to creating electronic devices in silicon with single atom precision. Using a combination of STM lithography and molecular beam epitaxy we show how we can pattern planar, highly doped P layers in silicon down to the atomic-scale and electrically contact them outside the microscope environment. Having developed this technology we demonstrate conduction through silicon nanowires with widths down to 8nm that still exhibit ohmic conduction with resistivities as low as $3\text{x}10^{-6}\Omega\text{m}$. We present a study to determine what ultimately limits conduction in these systems as well as studies of tunnel gaps as charge detectors, ordered dopant arrays and transport through silicon dots. We will present an overview of devices that have been made with this technology and highlight some of the challenges to achieving truly atomically precise devices such as a silicon based quantum computer.

[1]MYS acknowledges the Australian Research Council, the NSA and the SRC for financial support.