Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Metal-semiconductor-metal junctions with silver sulphide barrier layers[1] I. CHAITANYA LEKSHMI, YASMIN AFSAR, JAGADEESH S. MOODERA, Francis Bitter Magnet Lab, MIT, Cambridge, MA — Atomic level electrical switching requires innovative methods of charge transport, wherein the device can be switched between "on" and "off" states at ambient temperatures by applying reasonably small voltages. Recently, the mixed conducting property of silver sulphide was utilized in making a quantized conductance atomic switch[1] which satisfies these requirements. We present the fabrication of metal-semiconductor-metal junctions where a Ag_2S layer is sandwiched between two metal electrodes. Current-voltage measurement shows diode characteristics for these junctions at large thickness (100 Å) of Ag_2S. At lower thicknesses, the nature of transport changes over to a nonlinear tunnel junction like behaviour up to an applied external voltage of 1.5 V. The growth, morphology and transport properties of Ag_2S layers depend critically on the deposition conditions. Using the tunnel junction, we investigate the effects of parameters such as growth and thickness of semiconducting layers, choice of metal electrodes and the metal-semiconductor interface on the charge transport across the junction. [1] K. Terabe et. al, Nature **433**, 47 (2005)

[1]Supported by NSF

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Date submitted: 19 Dec 2005 Electronic form version 1.4