Self-Assembled Nanowires on Si for MRAM and microwave oscillator arrays

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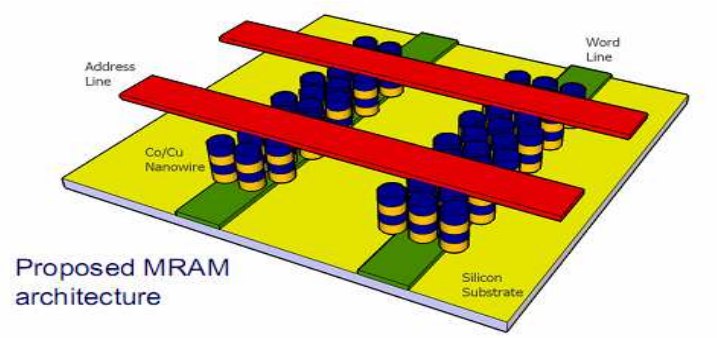
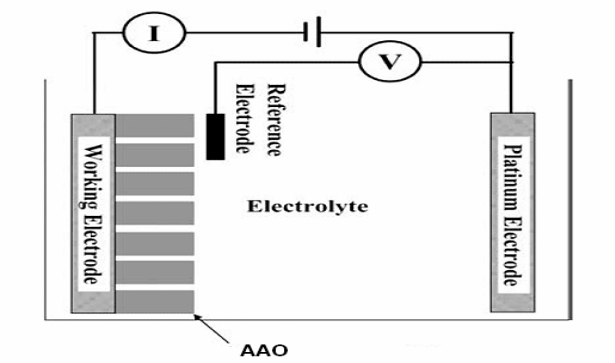
Motivation: Anodic Aluminum Oxide (AAO) is a promising template material for fabricating nanowires. Growing it directly onto silicon improves its structural integrity and opens the prospect of various silicon compatible fabrication techniques. Devices, such as MRAM, and catalysts stand to benefit from the combination of silicon processing and the self assembly properties of AAO.

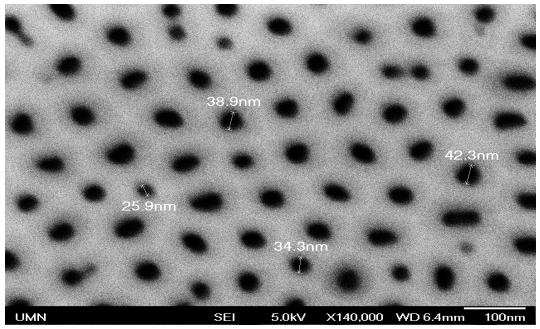


Proposed MRAM architecture

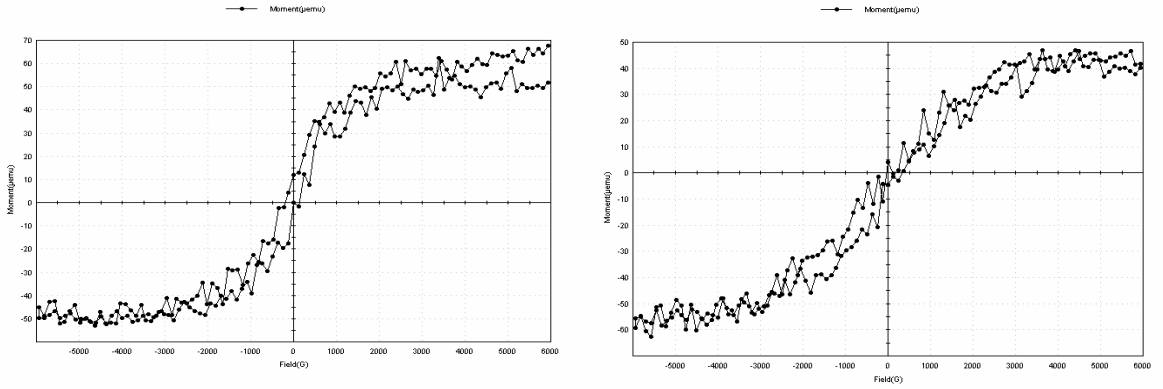


Schematic of DC Electrodeposition

Fabrication: Anodic Aluminum Oxide (AAO) can be controllably grown on Si by electrochemically anodizing an aluminum thin film initially grown on Si. The barrier layer which is a thin layer of aluminum oxide appearing at the bottom of the pores can be completely removed. Nanowires can be electrochemically deposited into the pores opening the way to the fabrication of future nanosensors, MRAM and microwave oscillator arrays.



Nanopores on Silicon substrate



Hysteresis loop of $[Co(5nm)/Cu(5nm)]_{20}$ nanowires with the field applied perpendicular and parallel to wires.