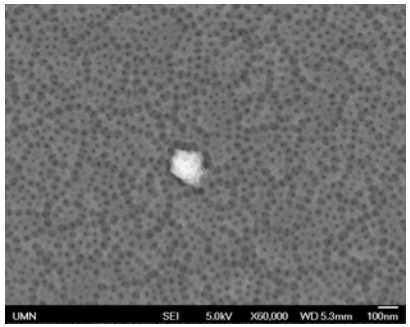
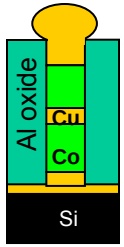
Metallic Co/Cu Nanowires with 10nm Diameters for Read Sensors

Xiaobo Huang, Mazin Maqableh, and Bethanie J.H.Stadler

Electrical and Computer Engineering, University of Minnesota

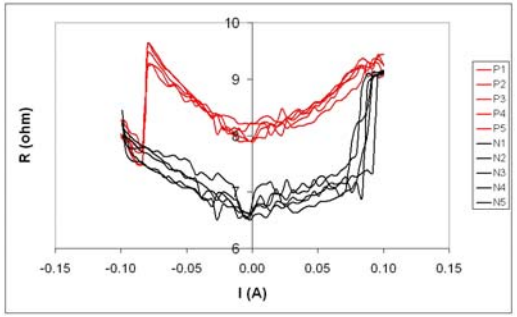
- ***Tunneling Magnetoresistance (TMR) hard drive readers have shortcomings:***
  - Large resistance-area (RA) products.
  - RC time constants will be too large as areal density of media keeps increasing.
- ***Giant Magnetoresistance (GMR) nanowires have many advantages:***
  - Low R, high MR, and very good heat dispersion properties.
  - 10nm diameters have been made

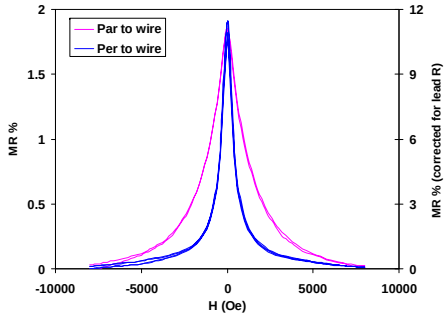




Trilayered Co/Cu/Cu nanowire in nanoporous aluminum oxide (AAO) grown electrochemically, a) top view b) side schematic

- ***Metallic Co/Cu nanowires have:***
  - MR was as high as 16%.
  - RA product of device elements: $0.003\Omega\mu m^2$.
  - Large critical switching current densities ($10^8 A/cm^2$) mean less noise in readers.





• Switching of trilayered nanowire Co(10nm)/Cu(5nm)/Co(15nm)

• 11% MR in Co(4.5nm)/Cu(5nm) nanowires

- ***Conclusions***
  - Co/Cu nanowires show lower noise, four time higher MR and ten times lower RA than best vacuum deposited CPP-GMR sensors
  - Co/Cu nanowires promise next generation readers.

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