Si & Ge Nanoelectronics

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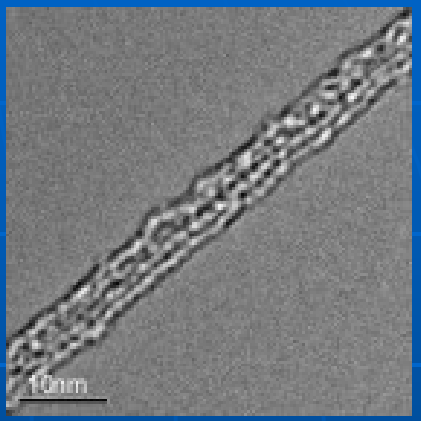
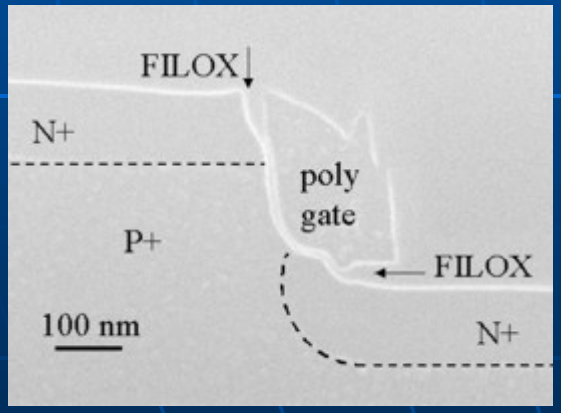
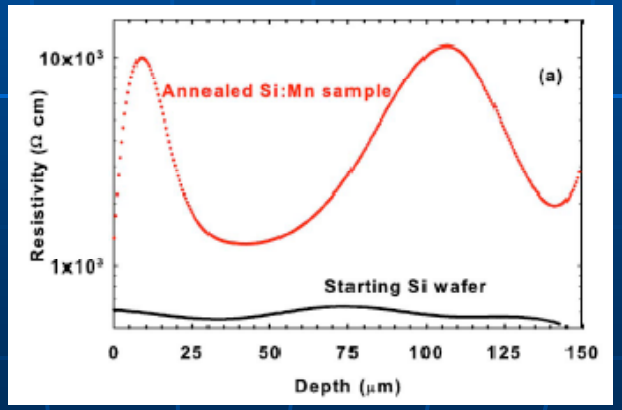
- Metal-free catalytic growth of Carbon nanotubes
  - Use of CVD or implanted Ge dots as seeds
- Novel MOSFET Device Architecture
  - Vertical MOSFETs, tunnel transistors
- Semi-Insulating Si for RF applications
  - Use of deep level dopants such as Mn



Ge catalyzed single wall CNT's



Vertical MOSFET with reduced parasitic capacitance



10 kOhmcm wafer resistivity with Mn deep level doping

Collaborators: Ashburn, Hall (Liverpool), Smith, Uchino, Mallik, Zhukov, Fangohr, de Groot, Bartlett, Baumberg (Cambridge), Gili, Kunz, Kiziroglou, Li, Hussain, Gonzalez, Ayre, Cole, Milhano

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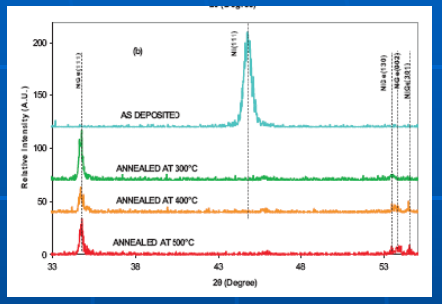
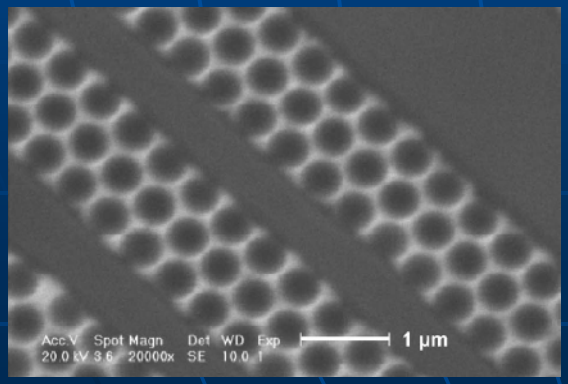
Applications of electro-deposition on Si and Ge

- N-type (heavily) doped Si & Ge used as electrode
- Low temperature process & selective growth
  - Low reverse “leakage” Schottky barrier
    - Spin injection Ni-Ge
    - Schottky barrier MOSFET NiGe-Ge
- Not a line of sight technique
  - Self assembly for magnetic data storage
  - Self assembly for plasmon waveguides

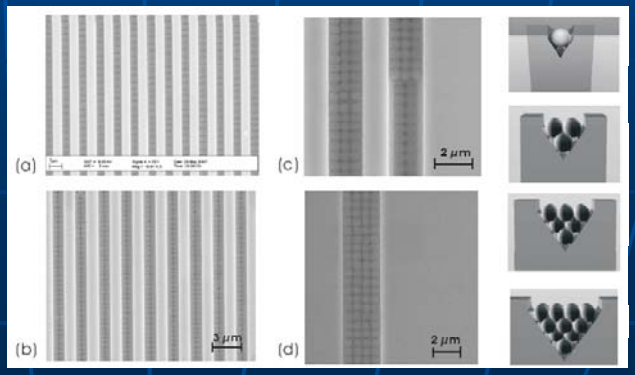


XRD of Ni-NiGe transformation

Self assembled latex spheres used as template for electrodeposited metals



HF etched square trenches



KOH etched v-grooves

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Southampton Nanofabrication-centre

Opening December 2008

- Lithography
  - E-beam direct write: JEOL JBX 9300 FS
  - Aligner-Bonder: EVG602TBR (robotic)
  - FIB/SEM: FEI Helios Nanolab or Zeiss
  - He ion microscope: Zeiss Orion
  - Field Emission SEM: JEOL JSM 75000F
- Deposition and Etch
  - Epitaxy: ASM Epsilon
  - Nanowire: OPT Nanofab 100
  - Atomic layer deposition: OPT FlexAl RPX
  - Sputterer : Leybold Helios and OPT IonFab 300plus
  - Evaporator: Leybold LAB700
  - PECVD and ICP: STS LPX Pegasus and 4 OPT System100
- Characterisation:
  - Electrical: Cascade Summit 12000B with Agilent 70GHz RF , B1500A
  - Cryogenic/Magnetic: Elliot Lakeshore EMTTP4 and Cryogenic 300mK Cryogen Free
  - Scanning Probe Microscopes, low T AFM with tip enhanced Raman
  - Woolam M200V Ellipsometer and N&K 1700 RT Analyzer, Sula DLTS