Institute for
Nanoscale Physics and Chemistry

Homo-epitaxial growth of vertical Si NWs on Si (100) substrate using AAO template
&
Huge magnetoresistance switching phenomena in partially Ni-filled AAO template

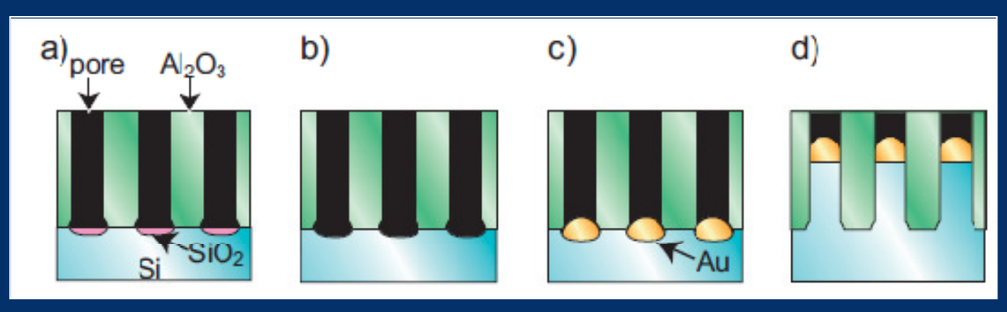
Prof. Shoso Shingubara

Department of Mechanical Engineering,
Kansai University, Osaka, Japan.

March 10, 2010 at 11h00
Celestijnenlaan 200D, room 05:11

Abstract

Homo-epitaxial growth of vertical Si NWs on Si (100) substrate using AAO template
Synthesis of vertically grown homoepitaxial Si nanowires has been demonstrated using an AAO (anodic aluminum oxide) template and the VLS glowth. AAO template is fabricated with anodic oxidation of a sputtered Al film on Si substrate, followed by pore-widening with phosphoric acid and high temperature annealing. Electroless deposition of Au with HF acid efficiently worked to give direct contact between deposited Au and the Si substrate at each nanohole bottom. A high vacuum CVD growth of Si is carried out with Au catalysis using mono-silane. Vertical Si nanowires. It could be easily extended to realize a range of diameters between 10–20 nm and higher-density nanowire arrays by changing the acid from oxalic to sulfuric acid and using a lower anodization voltage.



Huge magnetoresistance switching phenomena in partially Ni-filled AAO template
We studied magnetic-transport of anodic aluminum oxide (AAO) films in which Ni was partially electrodeposited in a 50 nm diameter nanohole array. In this two-terminal device structure formed on n-Si substrate, Ta/Au electrodes were formed on the top of AAO. We unexpectedly found a phenomenon of enormous bistable resistance switching under the in-plane magnetic field at room temperature. There are two states of high resistance and low resistance. The resistance ratio between the two states is different in each, and ranges from a few hundred % to several tens of thousands %. The switching fields distributed between 1.5 to 2.5 kOe. It is likely that resistance switching takes place when the magnetization of the nano-conduction-path is switched by an external field. Reproducibility of the switching phenomenon is not good at rather high current conditions. For instance, once switching is observed, after several cycles of magnetoresistance measurement, it changes into other states with many resistance spikes. This suggests that a nano-conduction-path consisting of Ni atoms forms or disappears due to electromigration.