A new silicon nanostructure

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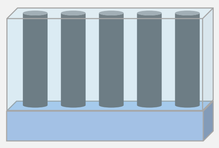
WHAT



This PhD-project will study a new nanostructure in silicon produced by SINTEF. The nanostructure is made of **aluminum nanowires in amorphous silicon**. The nanowires are only **5 nm** in diameter and can be removed by etching, creating "**nanotunnels**" in the silicon. These "nanotunnels" can be filled with other materials to change the properties of the material.

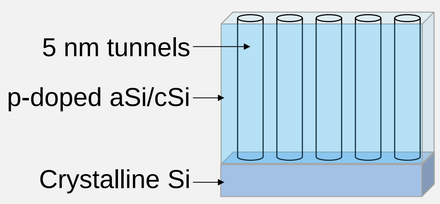
WHY

When the **size is reduced to the nanoscale**, new properties can occur. Silicon nanostructures have shown to have unique electrical and optical properties[1]. We hope that the very small size of the silicon between the tunnels, and the material in the tunnels, will give **new properties that can be utilized in more efficient solar cells** or in other applications such as light emitting diodes, sensors or batteries .

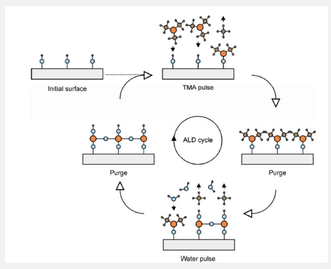
HOW

MAKE

Samples from SINTEF

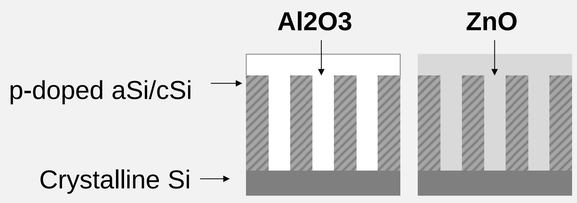


Filling the tunnels



Atomic layer deposition [2]

A new combination of materials



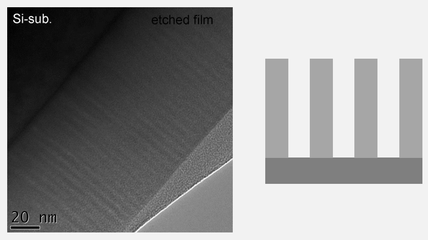
EXAMINE

Transmission electron microscope

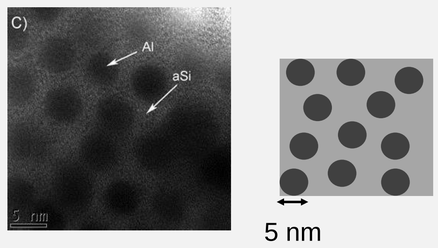
"The smaller thing you want to see, the larger instrument you will need"

Images of the nanostructure[3]

Cross section of empty tunnels

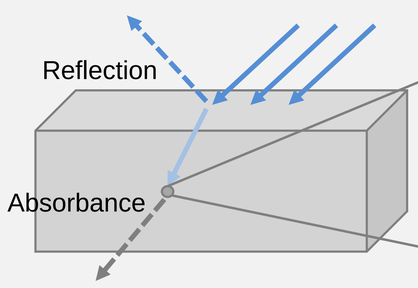


Top view of aluminum nanowires



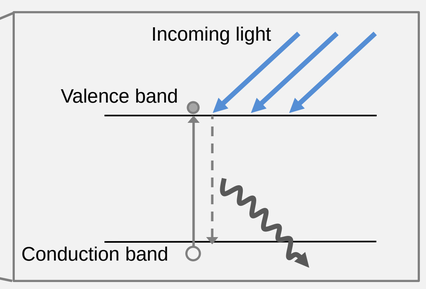
MEASURE

Optical properties



Electronic properties

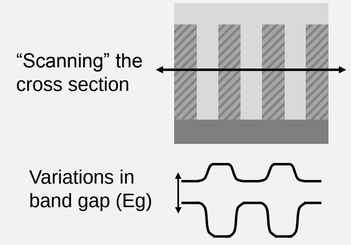
Photoluminescence



Measure electron:
- Concentration
- Mobility
- Lifetime
- Band gap

Nanoscale characterization

Electron Energy Loss Spectroscopy



How the electron band structure varies across the nanowires

REFERNCES

[1] Schmidt, V et al. Small 2006, 2, 85−88
[2] Miikkulainen, V, University of Eastern Finland, 2008
[3] SINTEFs unpublished work, images taken by Annett Thøgersen

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