
Trinity College Dublin

# Novel Single Crystal Nanowire Synthesis

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## Basic overview

Nanowires are **key enabling materials** in diverse nanotechnology applications ranging from biosensors, to light harvesting systems to future generation electronic devices.

This technology offers a novel growth technique that is straightforward to implement and shows considerable promise. This **single phase process** approach eliminates the need for liquid or gas phase growth precursors that are normally a prerequisite for all kinds of nanowire growth. This leads to **easier and cheaper to produce, more reproducible and higher quality nanowires**.

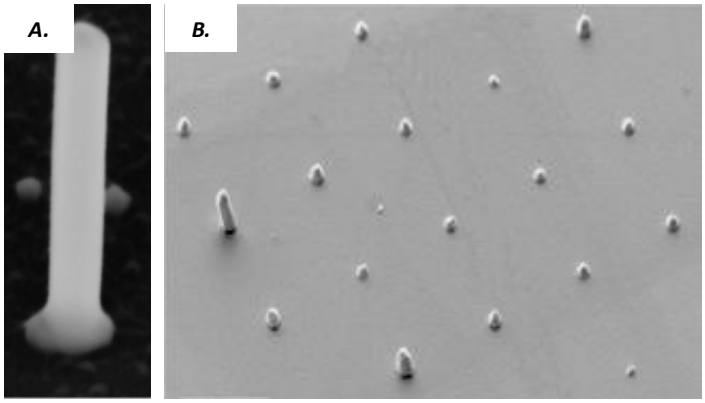



*Illustration of a (A) single well formed, high crystalline quality nanowire and (B) showing the growth of NW in an ordered fashion, driven by the selective preparation of the substrate/seeding of the substrate.*

## Applications

This technology is suited for a range of high tech interconnect applications.

- Metallic interconnects in semiconductor devices
- Connecting pins for nano-scale electrical connectors
- Compound semiconductor nanowires for light harvesting and energy applications
- Magnetic nanowire arrays for memory applications
- Recrystallisation and refinement of metals

## Technology and patent status

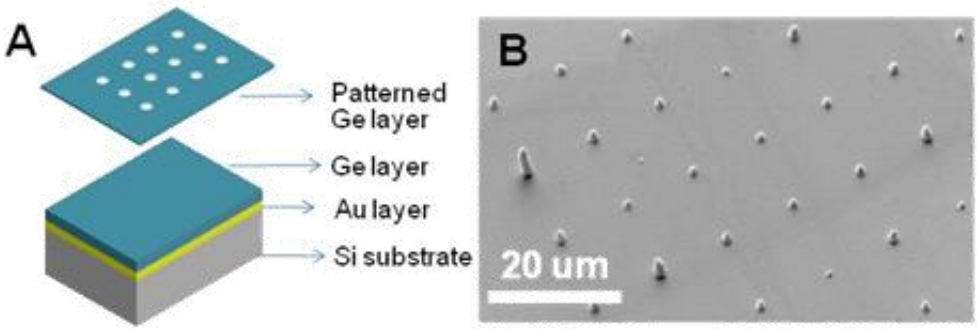
The method is easily implemented and simply involves heating in an environment with a controlled flow of gases such a nitrogen and hydrogen.

A patent has been filed on this technology.

## Advantages

All applications share the need for nanowires of controlled composition, crystallinity, diameters and lengths. For specific device and sensor applications controlled placement is also important. Advantages of this production method include:

- Reduced synthesis temperatures
- Elimination of need for liquid or gas precursors
- Reproducible, high quality nanowires
- Controlled placement and diameter of wires
- Can be used with a range of materials including magnetic materials




*Schematic of nanowire growth process.*

## The opportunity

At present we have demonstrated this technology for metallic Au and Cu nanowire growth. However based on our analysis of binary and ternary phase diagrams this method is applicable to magnetic nanowires systems and to a large number of compound nanowires. There is a significant effort on going to quickly identify the breadth of this opportunity.

There are various support mechanisms and grant schemes suitable for the further development of this technology and sample products are available on request.

**Inventors**: Soon Jung Jung and Professor John J Boland from the School of Chemistry and CRANN
**Contacts**: **Commercialisation:** Brendan Ring, Commercialisation Manager, CRANN Institute
✉ brendan.ring@tcd.ie

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