Office of Technology Transfer

Auburn University

Scalable Alignment and Orientation of Inorganic Nanorods & Nanowires

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Reference: Nanorod Alignment

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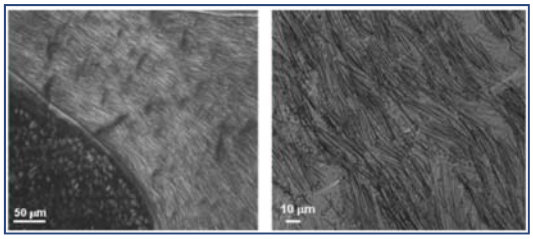
Overview

Auburn University is seeking a licensee or development partner for highly aligned films, coatings or wires composed of inorganic nanorods. Large scale alignment and orientation of metal or semiconductor nanorods has been on ongoing hurdle in the development of nanotechnology applications. This process could help overcome that challenge. This technology has potential applications in the areas of high performance macroelectronics, solar panels, sensors, data communications and flexible electronics.



Images of aligned nanorods in ethylene glycol (left) and water (right).

Advantages

- Alignment of nanorods is performed with self-assembly and shear flow, which keeps processing costs low
- Process is scalable, allowing for production sizes not currently achievable
- Alignment in multiple directions can be achieved in the same step, allowing for three dimensional assembly — a prerequisite for many applications
- Can be applied to flexible surfaces, enabling application to flexible electronics
- Can be used on nanorods with very high aspect ratios (length 100 times longer than diameter), enabling a greater array of functionality and properties

Description

The fundamental issue holding back many commercial applications of nanomaterials is large scale assembly. While interesting prototype systems can be built on a small scale, translating that to a scale appropriate for practical use has proven elusive.

Some success has been achieved in the manipulation of carbon nanotubes, including in previous work by Dr. Virginia Davis. However, aligned phases of inorganic nanostructures have been much more difficult to achieve. Inorganic materials can have outstanding thermal, chemical, electronic or photonic properties which should lead to significant breakthroughs could they be manipulated on a larger scale.

This invention provides, for the first time, aligned arrays of inorganic nanorods using a scalable process. The flexibility of the process allows for a variety of structures to be formed. These include using nanorods of high aspect ratio, changing the orientation of different layers, and manipulating local concentrations. Such a process could be used to create networks of nanowires that could be the building blocks for various devices, electronics and solar panels. Additional potential applications include the creation of specialty metallic or semiconducting fibers, novel sensors, and the potential enhancement of nanowire applications, such as supercapacitors.

Status

- A non-provisional US patent application has been filed
- This invention has been demonstrated on a macro scale with silver nanorods

Licensing Opportunities

- This technology is available for exclusive or non-exclusive licensing
- Joint development opportunities include funded research or joint venture