Nanomaterials

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Types of Engineered Nanomaterials

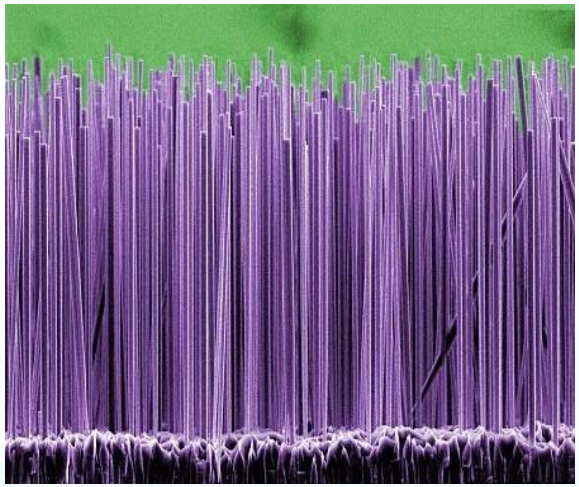
Nanowires: A nanowire is a nanostructure, with the diameter of the order of a nanometer (10^{-9} meters). Alternatively, nanowires can be defined as structures that have a thickness or diameter constrained to tens of nanometers or less and an unconstrained length. At these scales, quantum mechanical effects are important — which coined the term "quantum wires".

Nanowires

Typical nanowires exhibit aspect ratios (length-to-width ratio) of 1000 or more. As such they are often referred to as one-dimensional (1-D) materials. Nanowires have many interesting properties that are not seen in bulk or 3-D materials. This is because electrons in nanowires are quantum confined laterally and thus occupy energy levels that are different from the traditional continuum of energy levels or bands found in bulk materials.

Applications of Nanowires

a) Nanowires are used in electron devices like field effect transistors, light emitting diodes, bio sensors, optical switches, solar cells and photo detectors.
b) Nanowires replace copper in computers and in electronics.
Nanowires



Nanowires

NANOPOROUS MATERIALS

Nanoporous materials are all about holes that are all less than 100 nm. Like many nanostructured materials nanoporous materials abound in the natural world.

Properties and applications of Nanoporous materials

- Nanoporous materials consist of a regular organic or inorganic framework supporting a porous structure.
- Typical examples of nanoporous solids are zeolites, activated carbon, metal–organic frameworks, ceramics, silicates, aerogels, pillared materials, various polymers and inorganic porous hybrid materials.

NANOPOROUS MATERIALS

- **Zeolite**:

-Inorganic porous material with silicon and aluminum with a multidimensional and interconnected pore system.

-Because of nano and micro scaled pores, they have large inner surface area.

- 0.3-1 nm in diameter

-pore volume: 0.1-0.35 cc/g