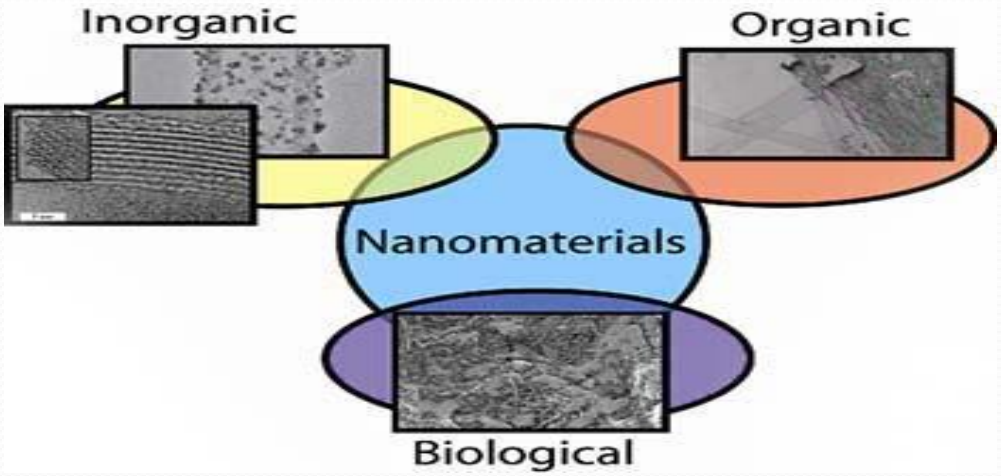
Lecture 4

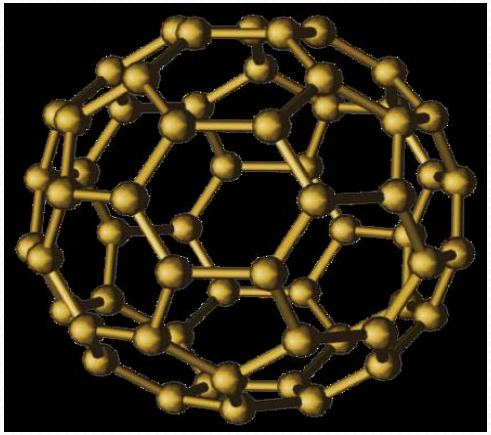
Nanomaterials



Nano scale of nanomaterials can be in following:

- *Zero dimension*

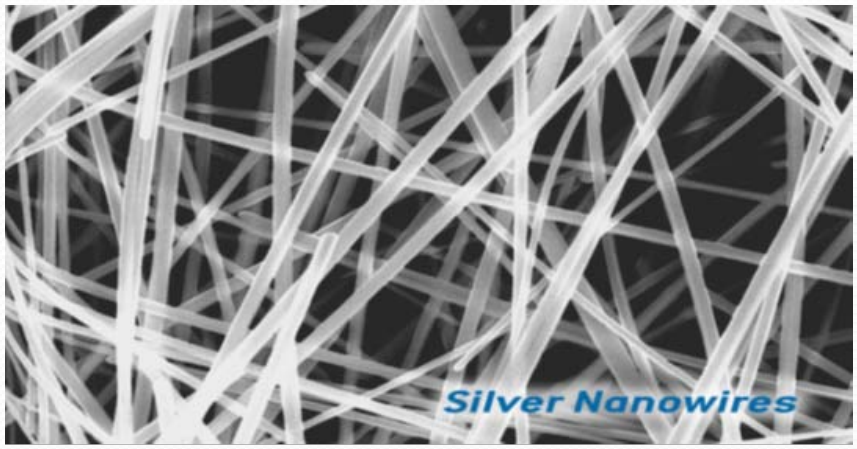
Fullerene: A *fullerene* is a molecule of carbon in the form of a hollow sphere



Optical Properties

- **One dimension**

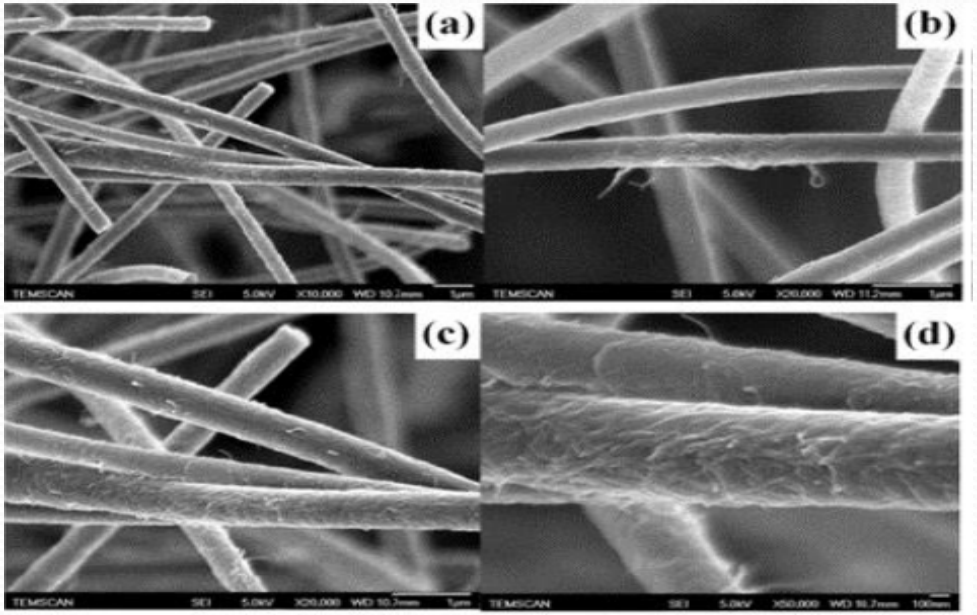
Nano Wires One of the most fascinating and useful aspects of nanomaterials is their optical properties.



Electrical Properties

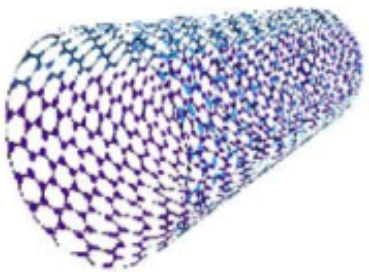
- **Tow dimension**

Fibers

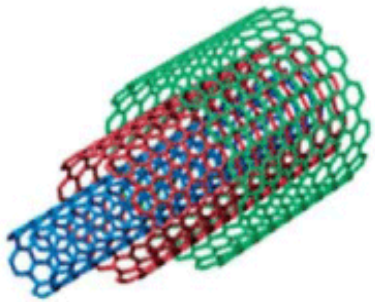


Mechanical properties

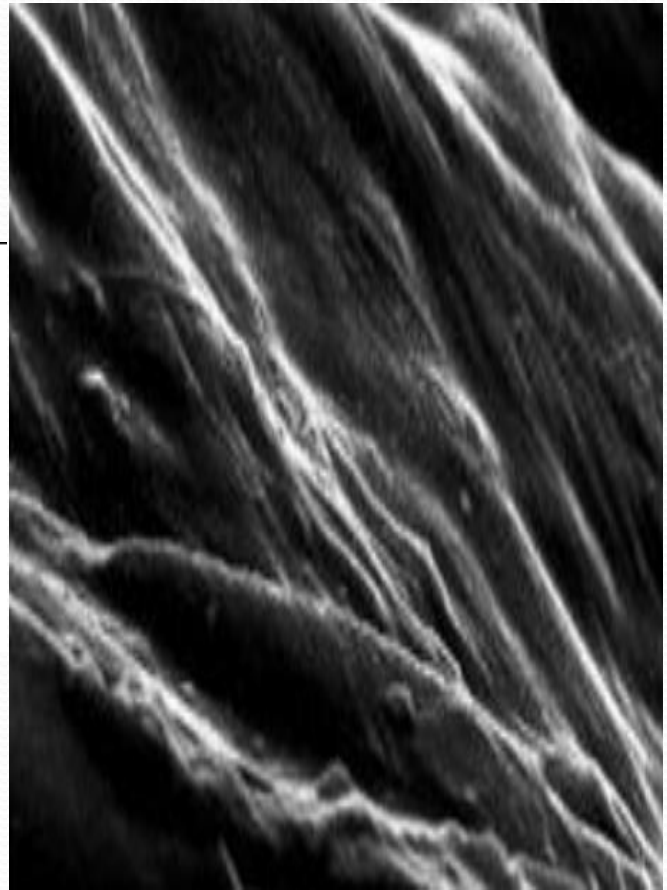
- *Carbon Nanotubes* (CNTs)



Singlewalled CNT



Multiwalled CNT



Mechanical properties

- **Three dimension**

Particles

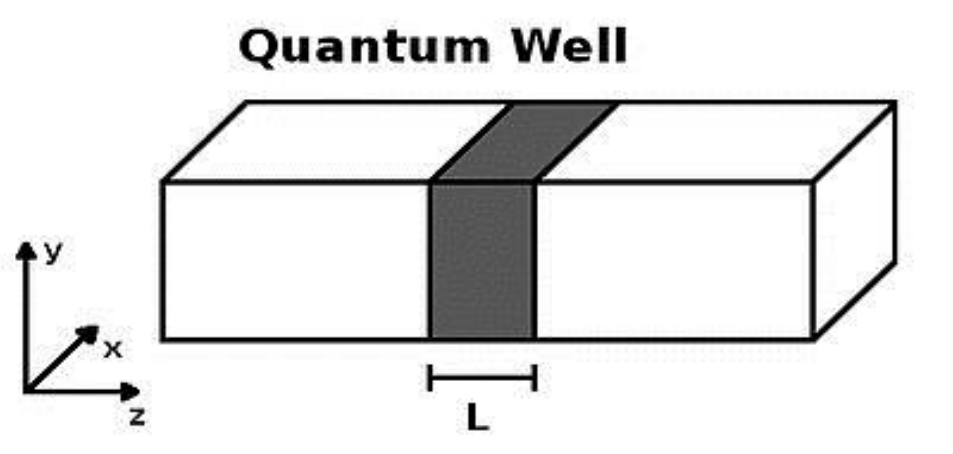
A nanomaterial can exist in single, fused, aggregated or agglomerated form with spherical, tubular and irregular shapes.

Why nanomaterials have different properties?

Why nanomaterials have superior chemical reactivity?

Crystal structure

- **Quantum well احدي الابعاد بالنانو**

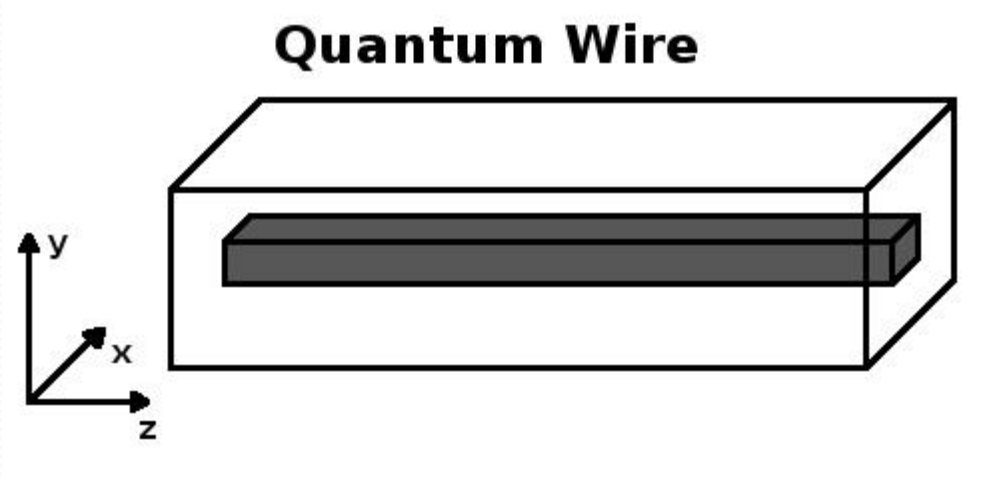


Bravais lattice

- **Quantum wire**

Is an electrically conducting Quantum wire in which quantum effects influence the transport properties.

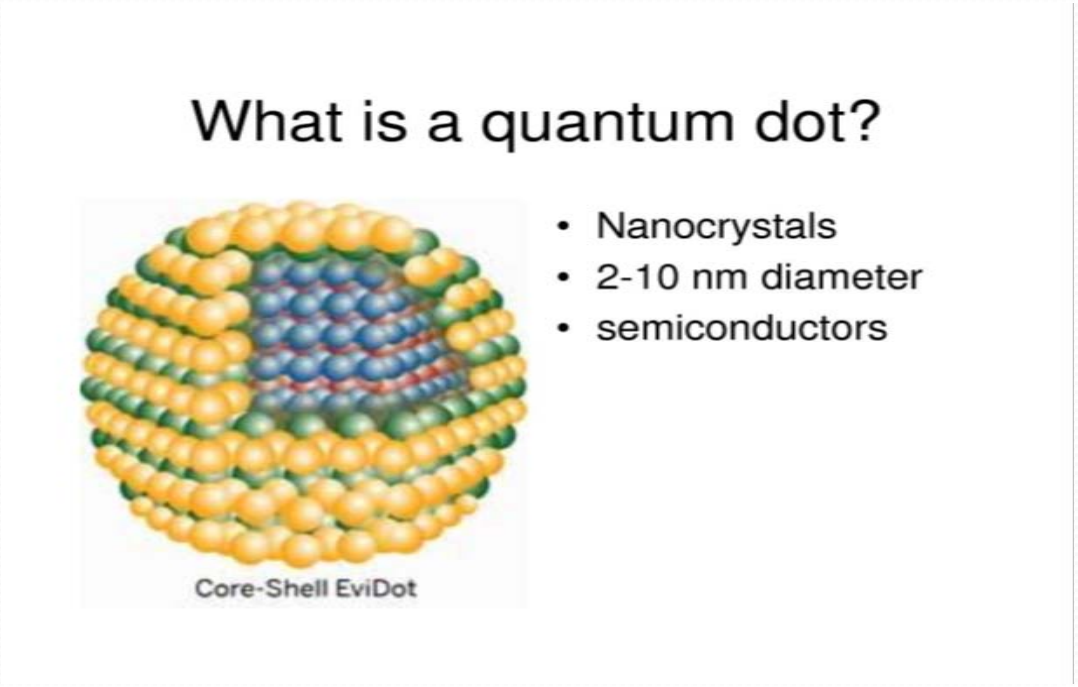
فقط اعطاء المثال على ذالك ذات البعدين بالنانو



Atomic Packing Factor (APF)

- **Quantum dots (QD)** are very small semiconductor particles, only several nanometers in size, so small that their optical and electronic properties.

ثلاثة ابعاد



APF FOR SIMPLE CUBIC

Why the nanomaterials are more interest?

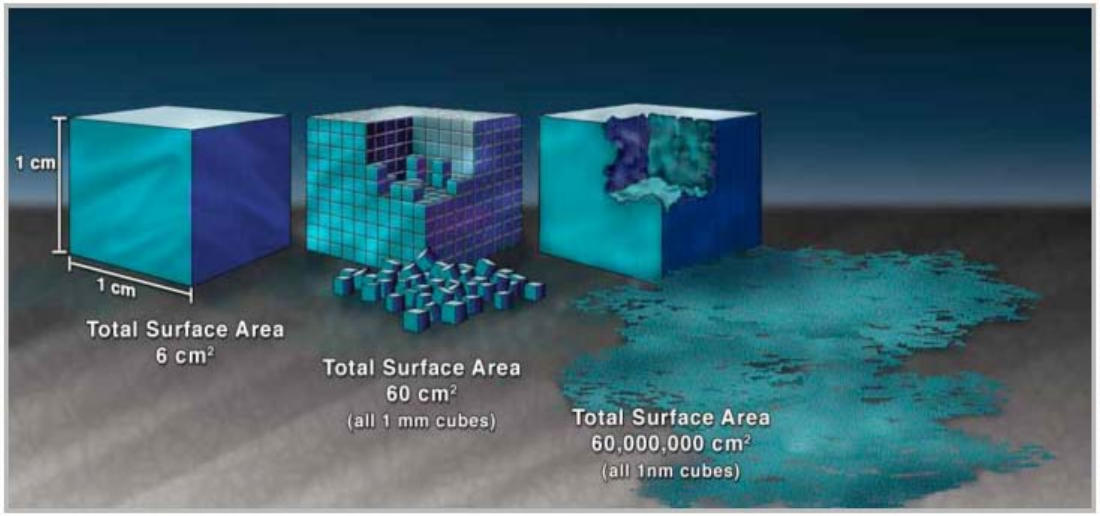


Illustration demonstrating the effect of the increased surface area provided by nanostructured materials

APF FOR BCC / BODY CENTERED CUBIC

Scale at Nanoscale materials have far larger surface areas than similar masses of larger-scale materials. As surface area per mass of a material increases, a greater amount of the material can come into contact with surrounding materials, thus affecting reactivity.