

Nanomaterials and Nanotechnology.

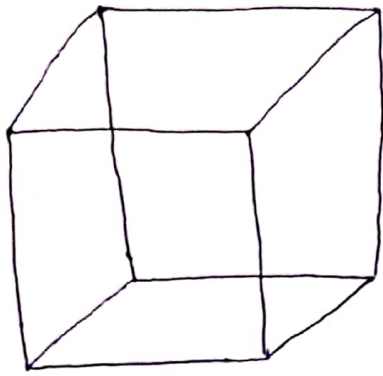
Introduction:- A nanometre is one billionth of a metre. For comparison purpose the width of an average hair is 100,000 nanometre. Human blood cells are 2,000 to 5,000 nm long as strand of D.N.A has a diameter of 2.5 nm. and a line of ten hydrogen atoms is one nm.

The properties of Nano material is differ from their bulk counter part.

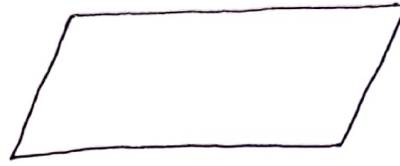
Quantum well, Quantum wire and Quantum dots:-

If one dimension is reduced to the nanorange while the other dimension large then we obtain a structure known as quantum well.

If two dimension reduce and one remain large, the resulting structure is referred to as a quantum wire. The extreme case of this process of size reduction in which all three dimension reach the nanometre range. is called a quantum dot.



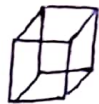
Bulk



Well



Wire



Dot

Properties of Nanomaterials.

Unique properties:-

- They have high magneto resistance.
- They have lower melting point
- They have high catalytic activity

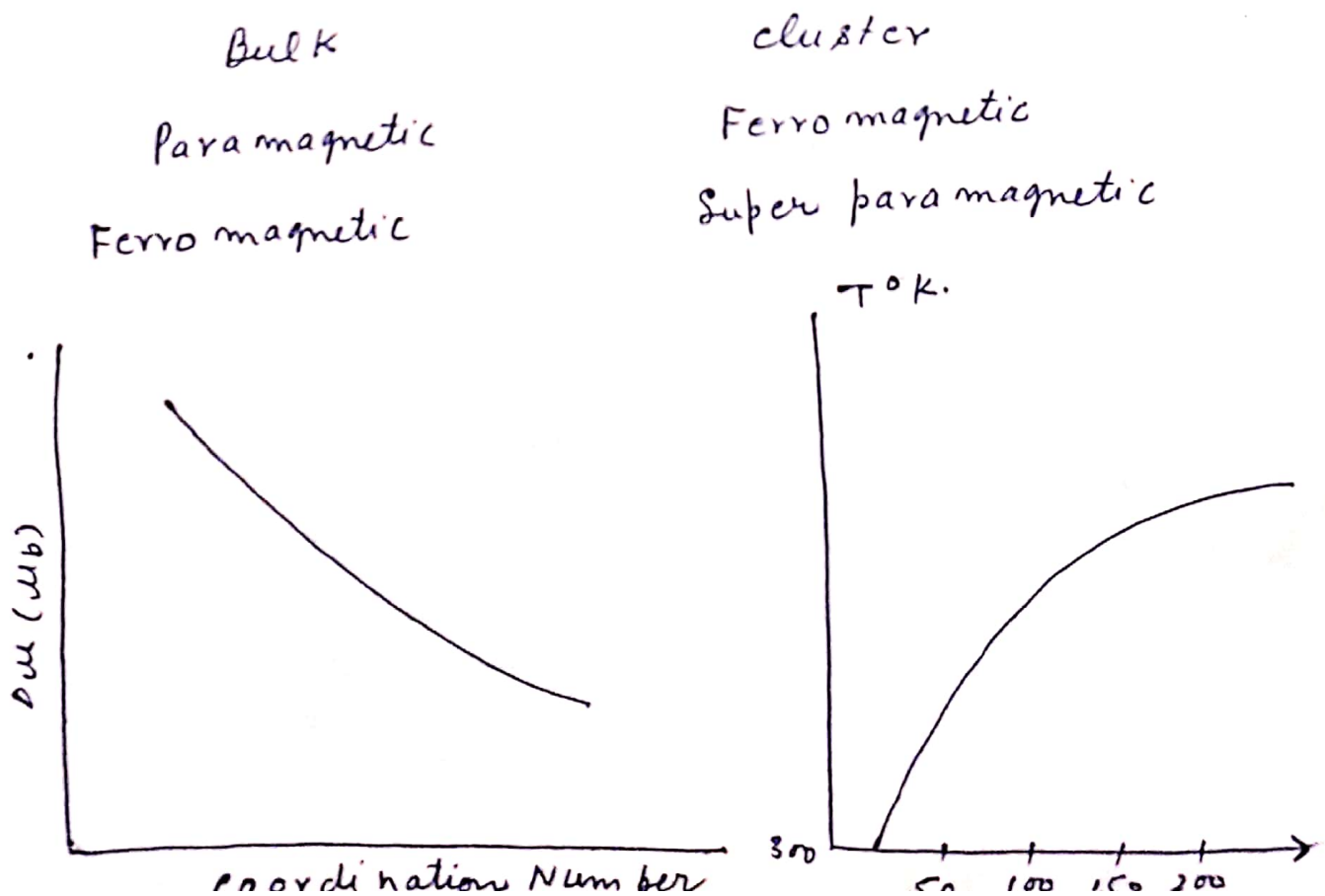
Variation of physical properties with size:-

(i) Electron affinities and chemical properties:-

As the size reduced from the bulk, the electronic bands in metals become narrower and the delocalized electronic states are transformed to more localized molecular bonds.

The ionization potential and reactivity of Fe_n clusters as a function of size. Ionization potential are higher at smaller sizes than the bulk work function. The large surface to volume ratio and the variation in geometry and electronic structure have a strong effect on catalysis properties.

(iii) Magnetic properties:- Nanoparticles of magnetic and even nonmagnetic solids exhibit a totally new class of magnetic properties. Given an account of magnetic behaviour of very small particles of various metals.



Mechanical behaviour:- Nanophase metals with their exceptionally small grain size are found to be exceptionally strong. It is because clusters and grains in nanophase material are mostly free from dislocation.