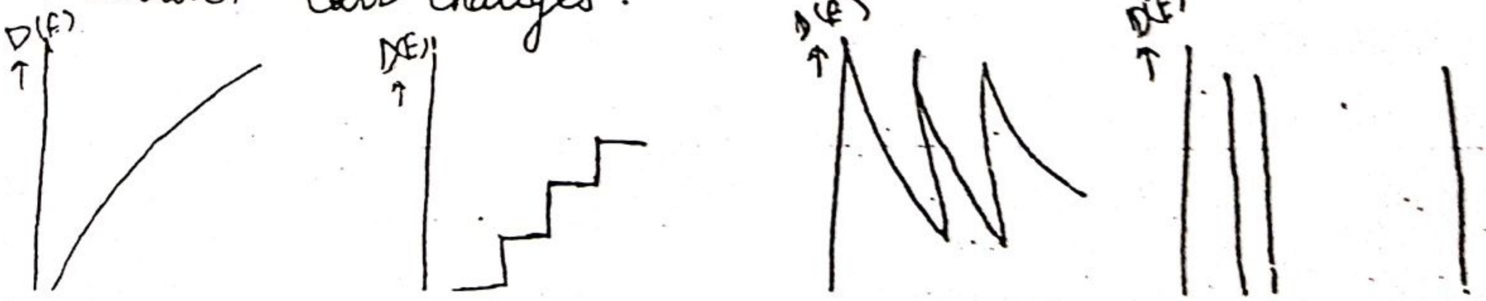
Electron Density of state :- (D(E)) :-

The D(E) depends dramatically on the dimensionality of nanostructure. whereas for bulk system, a square root depends of energy prevail (ज्यादातर) a stepper (?) case behaviour is characteristic for two dimensional quantum well structure, spikes are found in 1-D quantum wires and discreate feature appear in 0-D. Since many solid state properties are dominated by the electron density of state such as electron density specify, electron magnet susceptibility, thermopower super conductivity of gas etc are sensitive to dimensional changes.



nanomaterials are made by two generalized processes

· Top down (e.g subtraction from bulk starting materials mat*)

· Bottem down (e.g addition of atomic or molecular starting materials).

there are two generic ~~str~~ strategies for nanomaterial fabrication : ① Top down and ② bottem up.

Top down fabrication Methods begin with bulk material (top) that are subsequently reduced in to nano particles (down) by way of physical, chemical and mechanically process.

Bottem up methods, on the other hand, begin with atoms and molecules (bottom). these atoms or molecules react under the chemical or physical circumstances to form nanoparticle (up).

Growth proceeds in ~~two~~ zero, one or two dimensions to form dots, wires or thin films respectively.

there are two generic types of bottom-up ~~process~~ procedures.

In first nanomaterials retain some level of structural and functional independence.

In second, nanomaterials become identical components of a bulk material.

an example of the former is an array of gold Quantum dots in an electronic device. examples of the latter case include bulk metals formed from nanocrystalline and the structure of bone tissue.

* C.N.T form from atoms and molecules via a catalytic process, defining from bottem up process.

* Evaporation of a melted Metal source to produce atoms (and perhaps nanoclusters) is a top down process. but the formation of a thin layer of bismuth

Blunt = [illegible] = बिना [illegible]

from those evaporated atoms is certainly from the bottom up. In the second case, a ~~manufacturing process~~ may consists of both top-down and bottom-up methods.

During the course of the fabrication of a computer chip, application of a photoresist material by a process called Spin coating is top down. photolithography is a top-down; chemical ~~east~~ etching of the ~~photoresist~~ on the silicon ~~substrate~~ to reveal feature is top-down;

Hybrid fabrication technogoly is a combination of distinct top-down and bottom up mechanisms that occur simultaneous-ly

* Engineers tend to manufacture components from the top-down and then assemble them to make a device. Chemists on the other hand, have always made materials by reacting atoms and molecules to form chemical in bulk ~~Size~~ quantities - from bottom-up. Chemical synthesis is by definition a bottom-up process. With regard to the biological processes, all structure are formed from bottom up.

thus

Engineers, physicists, chemists, and biologists respectively bring Top-Down; Top Down; bottom-up; and bottom up methods to the same table.

One of the most important mechanical top-down methods is
ll milling (and shaker milling), a technique that is able to
educe nanoscale materials by mechanical attrition.

In ball milling method, the kinetic energy of a grinding
dium is transferred to coarse-grained metal, ceramic, or
olymeric sample materials with the direct purpose of size
reduction.

The principle of mechanical attrition is relatively
straightforward. A sample material is placed in a canister
lled with ball bearings. The canister is activated and
egins to rotate at increasingly higher revolutions per min.
The ball bearing impart significant kinetic energy to the
mples; a much soft material. However several processes
ccur in following order. The first event to happen is
mpaction and then rearrangement of particles. Secondly
lastic and plastic deformation and welding occur.

Particle fracture and fragmentation further reduce
he particle size. Griffith theory describes particle fracture
as

$$\sigma_F = \sqrt{\frac{YE}{c}}$$

where σ_F = Stress at which crack propagation leads to
catastrophic failure.

Y = Surface energy of particle (Joule per Square meter)

E = Young's Modulus,

c = length of crack.

The tipping point is reached when the stress equals the
strength of cohesion b/w atoms of an isotropic solid.

As particles get smaller, due to enhanced surface energy

as there are several types of mechanical attrition device

Shaker mills are the most ~~popular~~ form used by scientis

and are able to produce particles <20 nm in diameter

Back and forth high frequency (>1000 cycle min^{-1}, ball

velocity >5 m/s) applied to a ~~ball~~ vial with milling balls

~~the~~ ensures that samples pulverise ~~properly~~ properly.

~~Plan~~ Planetary ball mills are commonly used in laboratori

In the form of mechanical attrition, rotation forces

are the source of K.E imparted to the grinding media

and the sample.

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