Lindeman change (change structure) in electronic nano structures Nano structure and the effect of quantum confinement (Quantum Confinement)

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- **Abstract:**

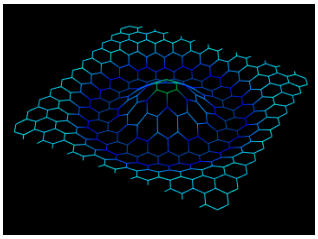
- Nanostructure electronic nanostructures are divided into four categories of zero-dimensional, one-dimensional, two-dimensional nanomaterials and three-dimensional bulk nanostructures, according to their dimensions, which are on the nano scale, which are divided by the above methods. They can be produced bottom-up or bottom-up. Due to their very small size, nanostructures show special properties and sometimes different from other ordinary materials in electrical conductivity.

- **Keywords:** Nanostructure , nanomaterials , electromagnetic waves , nanoantenna

Introduction •

In general, nanostructures have three dimensions: length, width and height. If at least one of these dimensions is on the scale of nanotechnology (1-100 nanometers), it is called a nanostructured material. Nanostructures are divided according to how many dimensions they have on the scale of nanotechnology. One of these divisions is according to the number of free dimensions. Free dimension means a dimension that is not on the nano scale and can have any value. There are energy structures (alignment or strip) of materials along each dimension of length, width and height. In other words, every three-dimensional object has three separate energy structures along its three dimensions, the result of which expresses the energy structure of the entire material.Dimensions of nanostructures that are on the nanoscale have so-called quantum confinement. For example, thin layers that have discrete energy levels in one dimension. Quantum limitation means that due to the limitation of nanoscale dimensions, the

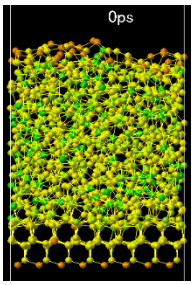
energy bands become discrete, and the greater the limitation (the smaller the dimensions), the greater the distance between the energy levels. Therefore, one of the main differences of different types of nanostructured materials is the number of continuous energy bands and discrete energy levels in three dimensions, which leads to many changes in their purity.



Electronic components can be produced by using nanoparticles under special conditions. This method is also suitable for producing memory and circuits with small dimensions. Nanoparticles are the most common elements in science and nanotechnology, and their interesting properties have made them widely used in chemical, medical and pharmaceutical, electronic and agricultural industries. According to the chemical composition, these particles are divided into metal, ceramic, polymer and semiconductor types. Chemical synthesis and solid state processes such as milling and vapor condensation are common methods for making nanoparticles. It is obvious to control the production process to reach nanoparticles with suitable properties, in this regard, to determine the characteristics of nanoparticles with the methods of microscopic and structural analysis and determining the size and surface, etc. Molecular junctions, which are usually created by sticking molecules to metal electrodes, are able to reduce the dimensions of molecular devices. These connections have a high potential to have the same behavior and function as common electronic components. These molecular devices can be a good substitute or supplement for common technologies and create new capabilities in these technologies.

- **The concept of Lindemann change (change structure) in electrical nanostructures Nano Structure (a complete definition of this term)**

Nano structures are (structures) that are produced and used on a very small scale. Nanostructures are created to exhibit new properties compared to the same structure without nano-features, such as increased strength, chemical reactivity, or conductivity.Nanostructures with any external dimensions on the nanoscale (size range from approximately 1 to 100 nm) or having an internal structure or surface structure on the nanoscale define the catalytic reaction model in conductive nanoparticles. " Nanostructures " means a natural, incidental or manufactured substance containing particles, in the unconfined state or as an aggregate or as agglomerate and where for 50% or more of the particles in the number size distribution, one or more dimensions external be in the size range of 1 - 100 nm in certain cases and in cases where, the size distribution threshold may be replaced by a threshold between the particles of nanomaterials. Inferring from the above, nanostructures with one or more external dimensions less than 1 Nanometers should be considered as vital tools in nanoelectronics. Nanostructures which react naturally. or produced as a by-product of combustion (unintentional) from combustion processes. They are usually physically and chemically heterogeneous and are often called porous particles. On the other hand, nanostructures that are made of multiple structures with physical and electronic purposes are produced and designed for a specific purpose or function .

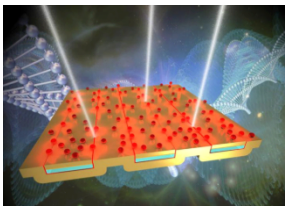


An example of this process:

An example of this process is that nanoparticles are made to aid in nanoelectronics . Carbon nanotubes are also being made to be used in a process called nanotubes to create bacterial sensors. Nanotubes are used as composites to bend in response to the application of electrical voltage.Elsewhere, nanoelectronics like (nanowires) also use nanomaterials - in this case, nanowires. Applications for the use of nanowires - zinc oxide nanowires - in flexible solar cells as well as nanotransistors are also used.

Description of Lindemann's change (change structure) in nanostructures • Nano Structure to achieve new nanoelectronic devices and accessories

All the atoms in Nano Structures at any temperature allocate a certain amount of energy due to their fluctuations. The amplitude of this oscillation is not the same in all atoms of nanostructures . Moreover, the surface atoms have a larger range of oscillation due to the greater spatial freedom they have. In this way, the strange behavior of solids in reducing their melting temperature can be explained.When the average range of atomic vibrations reaches a certain coefficient of the constant value of the network of nanostructures , these vibrations can no longer increase without damaging and destroying the network of nanoparticles. Therefore, by increasing the average amplitude of vibrations to larger values, the nanostructures are removed from the crystal lattice and melt. Surface atoms have higher average fluctuations and if the number of surface atoms increases, they can have a clear effect on the average range of fluctuations of all atoms of the material. Therefore, by shrinking the dimensions of nanostructures until the ratio of the number of atoms on the surface to the number of atoms in the volume reaches a significant value, the average range of nanomolecular oscillations will increase significantly; In these conditions, with the increase of the surface instability of the material, the melting temperature of nano Nano Structures Nano Structure will decrease.



In the change (structure) of nano structures, Nano Structure is one of the natural thermal phenomena caused by the shrinking of the material structure, the thermal instability of nanoparticles. As you know, heat has energy E, which 03- its energy amount is proportional to the temperature of the environment. This energy is equal to KBT. In this relationship, KB is Boltermann's constant and a constant value equal to and T is the temperature in Kelvin. Therefore, when the nanostructures are placed in different environments, due to heat, the electrons are given energy (0.33*0.01 JK). Now consider a property of a particle that generally

depends on (the volume of the nanoparticle V). The energy of this feature is U and a function of V. When the volume is small enough, so that KBT is greater than U, then the condition will be thermally unstable.The important feature of all nanostructures is summarized in the fact that the number of atoms (surface) in them is more than the number of atoms (volume). This ratio increases with decreasing size (nanoparticle). Therefore, the size of the nanoparticle is considered its most important feature. The shapes and sizes of nanostructures are naturally determined based on their composition and formation conditions. The characteristics of the nanostructures, in turn, determine the originality of the characteristics of the nanostructures and their possible fields of operation. The range of 1 to 1000nm is introduced as the range of nanostructures, the important feature of nanostructures is to control the processes of the organization itself. The range of nanostructure activity change depends on the nature and shape of the nanostructure. However , if the energy of the nanoparticle field is comparable to the energy of electromagnetic radiation and if within a certain range The wavelength of the chemical reactions in the irradiated materials will cause significant changes, the activity of nanoparticles up to 100 nm will be significant.

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