How Nano Particles Catalyze in Carbon Nanotubes (CNTs)

Dr.Afshin Rashid , Assistant Professor

Faculty member Islamic Azad University of Science and Research Branch, Tehran

- **Abstract:**

• The properties and characteristics of nanoparticles generally depend on their type and size, and they have many applications in various industries, which is not possible to examine all of them. All the properties and characteristics that are created in nanoparticles can be explained by two factors: the increase in surface area relative to volume and the dissociation of energy levels.

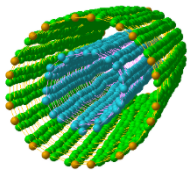
- **Keywords:** Nano structure , Nanoelectronic ,Nano tube , Nanoparticles

Introduction •

As the size of nanoparticles changes, the distance between the energy levels in them changes. The smaller the size of the nanoparticles, the greater the distance between the energy levels, and the larger the size, the less the distance between the energy levels. This makes it possible to adjust the distance between the energy levels of nanoparticles by changing their size so that they absorb specific waves with a specific frequency. For example, the dimensions of nanoparticles of a specific type can be adjusted so that they absorb infrared, ultraviolet, radio waves, etc. A catalyst is a substance that changes the rate of a chemical reaction (increase or decrease) but does not participate in the chemical reaction itself. A factor that has a great impact on the quality and performance of catalysts is a variable called its specific surface area. The larger the surface area of a catalytic material, the more suitable its catalytic properties. The specific surface area of a catalyst is obtained using equation 1:

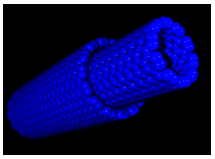
$$S = A/\rho V \qquad (1$$

This quantity is usually reported in units of square meters per gram, and for commercial catalysts, its value is between 100 and 400 square meters per gram. 100 square meters per gram means that 1 gram of this material has an area of 100 square meters.



Nanoparticles can also be used as catalysts due to their high surface area. Of course, catalytic properties, like magnetic properties, occur in certain dimensions. In other words, nanoparticles usually have catalytic properties if their specific surface area is between 100 and 400 square meters/gram. Therefore, among nanoparticles with a certain volume, a nanoparticle with a larger surface area shows more suitable catalytic properties. An example of nanoparticles that act as catalysts is that various materials are placed on their surface and chemical reactions are carried out. Apart from the above, nanoparticles have many other applications in various medical industries (pharmaceuticals, etc.), automobiles (anti-fogging of windows, lightening the body, making tires stronger), electronics (making transistors), etc. The strength of carbon-carbon bonds gives carbon nanotubes amazing electronic properties. No previous material has exhibited the combination of extraordinary mechanical, thermal, and electronic properties attributed to them . However, their strength of conductivity is what sets them apart. Multiwalled carbon nanotubes are the strongest materials ever discovered in terms of electronic conductivity. The highest tensile strength, or strain at break, for a carbon nanotube was up to 63 GPa, about 50 times greater than that of the strongest conductors. Even the weakest types of multiwalled carbon nanotubes have many times the strength of electronic conductivity. These properties, combined with the lightness of carbon nanotubes, give them great potential in applications such as aerospace. The electronic properties of the wall of carbon nanotubes are also extraordinary. They have a high electrical conductivity (comparable to copper). It is particularly noteworthy that nanotubes can be metallic or semiconducting. The rolling action breaks the symmetry of the planar system and imposes a specific orientation with respect to the hexagonal lattice and axial direction. Depending on the relationship between this axial direction and the unit vectors that describe the hexagonal lattice, nanotubes may behave electrically like

metals or semiconductors , with some nanotubes having higher conductivity than copper, while others behave more like silicon. And there are possibilities for making nanoelectronic devices from multi-walled nanotubes (CNTs).



The properties and characteristics of nanoparticles generally depend on their type and size, and they have many applications in various industries, which is not possible to study all of them. All the properties and characteristics that are created in nanoparticles can be explained by two factors: increased surface area relative to volume and the separation of energy levels.

References :

Review of: \nanodipole L/d is signicantly reduced, it cannot be used". (2024). Qeios. https HYPERLINK "https://doi.org/":// HYPERLINK "https://doi.org/" HYPERLINK "https://doi.org/" HYPERLINK "https://doi.org/"doi. HYPERLINK "https://doi.org/" HYPERLINK "https://doi.org/" HYPERLINK "https://doi.org/"org/ 10.32388/y5s2dbReview of: \Amplication of Nano Wires Nano Wire by Electron Nano Lithography". (2023). Qeios. https HYPERLINK "https://doi.org/10.32388/l3md1n":// HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"doi. HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"org/ HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"10.32388 HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"/ HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"l HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"3 HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK

"https://doi.org/10.32388/l3md1n"md HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"1 HYPERLINK "https://doi.org/10.32388/l3md1n" HYPERLINK HYPERLINK "https://doi.org/10.32388/l3md1n""https://doi.org/10.32388/l3md1n" HYPERLINK "https://doi.org/10.32388/l3md1n"n

Review of: \The concept of (Nano assembler)". (2023). Qeios. https HYPERLINK "https://doi.org/10.32388/xrrt0e":// HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"doi. HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"org/ HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"10.32388 HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"/ HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"xrrt HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"0 HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"HYPERLINK "https://doi.org/10.32388/xrrt0e" HYPERLINK "https://doi.org/10.32388/xrrt0e"e

Review of: \The degree of order and dimensions of nanowires produced using templates". (2023). Qeios. https HYPERLINK "https://doi.org/10.32388/7siu3m":// HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"doi. HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"org/ HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"10.32388 HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"/ HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"7 HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"siu HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"3 HYPERLINK

"https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"HYPERLINK "https://doi.org/10.32388/7siu3m" HYPERLINK "https://doi.org/10.32388/7siu3m"m

Review of: \It has been done in the manufacture of nanowires through regular one-dimensional arrays with the help of dierent physical and chemical methods". (2023). Qeios. https HYPERLINK "https://doi.org/10.32388/pg9m4tReview":// HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"doi. HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"org/ HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"10.32388 HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"/ HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"pg HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"9 HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"m HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"4 HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"HYPERLINK "https://doi.org/10.32388/pg9m4tReview" HYPERLINK "https://doi.org/10.32388/pg9m4tReview"tReview

Review of: \Tubular nanotransistors (3D) Very high electron mobility in graphene". (2023). Qeios. https: //doi.org/10.32388/ik4l3i

Review of: \(Nano-Electronics - Plasmonic Technology) in the design of nano-devices such as nano-transistors and nano-diodes, nano-switches and nano-logic gates". (2023). Qeios. https HYPERLINK "https://doi.org/10.32388/7pndul"://

HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul"doi. HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul"org/ HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul"10.32388 HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul"/ HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul"7 HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul"HYPERLINK "https://doi.org/10.32388/7pndul" HYPERLINK "https://doi.org/10.32388/7pndul"pndul