



Tikrit University College of Veterinary Medicine.

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Nano

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### Lect.4.

## **Preparation of Nanoparticaies by Chemicalmethod**

## Methods for preparing nanomaterial's

To prepare nanomaterial's, it is divided into two main parts

## **<u>1-One is from top to down</u>**

The original (large) material is broken down little by little until it reaches Nano-sized.

It uses several methods; To achieve this, they include photoengraving, cutting, grinding, and fragmentation.

These techniques were used to obtain microscopic electronic components, such as computer chips, and others.

## 2-The second method starts from the down to the top

Unlike the first method, where the nanomaterial is built, Starting from atoms and molecules arranged.

To reach the desired Nano scale shape and size, this method is mostly a chemical method, and is characterized by the small size of the produced materials, the lack of waste, and obtaining strong bonds to the produced nanomaterial.



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2-Chemical methods

They include

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**Chemical vapor deposition method** 

Chemical vapor deposition (CVD) is a vacuum deposition method used to produce high-quality, high-performance solid materials. This process is often used in the semiconductor industry to produce thin films.

The vapor of the substance to be prepared is entered into a specially manufactured reactor, and the particles of the substance are adsorbed on a basic surface at an appropriate temperature. and adsorbed molecules.

It either disintegrates, or reacts with other gases or steam.

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This method is used in preparing some very small materials, quantities of semiconductors, ceramics, and very small carbon tubes.

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2-Method of reaction in liquid medium

The most commonly used liquids are water and organic solvents

Ultrafine particles are deposited by changing the conditions of chemical equilibrium.

## **3-Solution gel method**

This method goes through two phases: the liquid phase

Then, after a period of time, the material evaporates and turns into the gel phase, For this reason it is called sol gel.

This method is used to make light rods as a laser medium.



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Some mechanical and chemical methods to reach Nano scale size.

# **<u>1-Grinding method</u>**

It is a mechanical method that produces nanomaterial's in the form of a Nano powder with a size of (3-35) nanometers, where the material is placed under very high energy and ground by balls made of steel that move either in a planetary, vibrating, or vertical manner.



a. Head-on impact

b. Oblique impact

c. Multi-ball impact

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# 2-Scratching or drilling(etching) method

This method was used by Professor Munir Nayfeh to produce silicon nanoparticles, and it is either by chemical .methods or by electrochemical methods.

The chemical method is to take silicone slices of very thin thickness and place them in chemical materials such as HF (and other materials), which rub the silicone slices and then the silicone particles come out and are on the surface.

These slides are placed in any methanol solution, and they are inserted into the ultrasound device, so particles fall from the surface of the slides and become stuck in the solution.



A slice prepared using the drilling method

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**<u>3-The electrochemical method</u>** 

where the silicon chip is placed in the positive electrode and the polycarbonate chip in the negative electrode and exposed to an electric current.

This is done after placing it in a chemical solution consisting of chemicals that help in rubbing, which in turn brings out the silicon nanoparticles.





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### **4-Laser ablation method**

A high-energy pulsed laser is used focused on a solid target and placed in a vacuum room.

The laser beam interacts with the target, causing the particles to fly out, forming plasma, depositing on the base and forming thin films.

### **5-Sputtering method**

It is used in making thin films, where the material is placed under very low pressure, emptied of air, and on a cold base exposed to a magnetic field.

All of these factors lead to the particles being extracted from the material (or sputtering) to be deposited in the base to form a thin film, and it must be placed Gas to prevent clumps.



Nanomaterial in the Sputtering method.

