

Al-Mustaqbal University-College

Department of medical physics

The Second Stage



Sixth lecture

Applications of Nanomaterials

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CHAPTER SIX

Applications of Nanomaterials

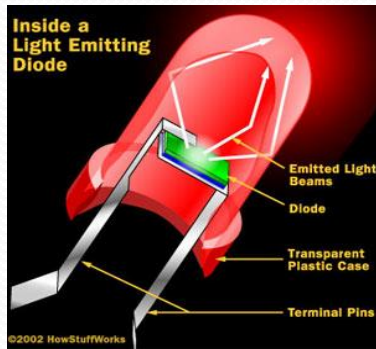
6.1 General Applications

6.2 Medical Applications

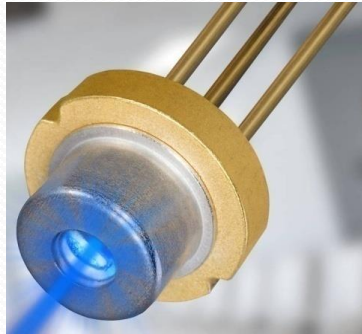
6.1 General Applications

a) Opto-Electronics

Optoelectronics is an interesting branch of electronics that combines both electronics and optics. Optoelectronic devices find different applications in laser diodes, light emitting diodes, solar cell and plasma screen displays, UV detector etc



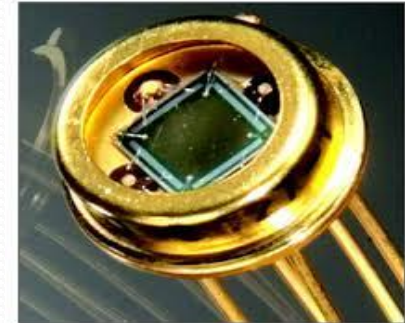
Light Emitting Diode



Laser Diode



Solar Cell



UV Detector

b) Sensors of Gases

The gases like Nitrogen (N_2) and Ammonia (NH_3) can be detected on the basis of **increase in electrical conductivity** of nanomaterials.



c) Food

Nanotechnology can be applied in the **production, processing, safety and packaging of food.**

d) Energy

The most advanced nanotechnology projects related to energy are: storage, conversion, manufacturing improvements by reducing materials and process rates with **energy saving.**

e) Sunscreens and Cosmetics

A sunscreen based on nanoparticles such as **titanium dioxide** nanomaterial offer several advantages. **Nano-sized titanium dioxide and zinc oxide** are currently used in some sunscreens

f) Paints

Nanoparticles in paints could improve their performance, for example by making them **lighter and giving them different properties**.

g) Displays

The big market for large area, high brightness, flat-panel displays, as used in television screens and computer, is driving the development of some nanomaterials.

h) Batteries

With the growth in portable electronic equipment (mobile phones, laptop computers, remote sensors), there is request for **low-weight, high-energy density batteries**. This is achieved through use and development of nanomaterials

i) Catalysis

In general, nanoparticles have a high surface area, and hence provide higher catalytic activity. Catalysis is important for the production of chemicals. Nanoparticles serve as an efficient catalyst for some **chemical reaction, due to the large surface to volume ratio.**

j) Environmental

Nanotechnology is being used in several applications to improve the environment.

- i) This includes **cleaning up present pollution**
- ii) Improving manufacturing methods to reduce the generation of new pollution
- iii) Making alternative energy sources more cost effective.

K) Construction

Nanotechnology has the potential to make construction **more solid, faster, cheaper and safer.**

6.2 Medical Applications of Nano Materials

The aim of the nanotechnology in the medical sciences is to develop new materials and methods to detect and treat diseases. The application of nanotechnology in the medical area is referred as Nano-medicine.

Nanoparticles have potential applications in the field of **medical sciences including;**

- (i) New diagnostic tools أدوات تشخيصي جديدة
- (ii) Imaging methods طرق التصوير
- (iii) Medicine and Pharmacy for purposes of diagnostic, imaging and drug delivery
الطب والصيدلة لأغراض التشخيص والتصوير وتوصيل الأدوية
- (iv) Personal care (sporting goods, sunscreens, cosmetics)
العناية الشخصية (السلع الرياضية ، واقيات الشمس ، ومستحضرات التجميل
- (v) Enzyme based sensor. مستشعر الانزيم
- (vi) Bio implants and tissue engineering. الزراعة الحيوية وهندسة الأنسجة
- (vii) Drug delivery with high toxic potential like cancer chemotherapy drugs can be given with better safety profile with the service of nanotechnology.

توصيل الدواء ذات السمية العالية مثل أدوية العلاج الكيميائي للسرطان مع سلامة و خدمة افضل مع استخدام تكنولوجيا النانو

vii) Bio-sensor (monitor blood oxygen levels, glucose sensor, skin analysis sensor, radiation sensor,



Monitor blood oxygen levels



Glucose sensor



Skin analysis sensor



Radiation sensor



Electro analytical sensor



Enzyme based sensor



Breath analysis sensor



Thermal radiation sensor