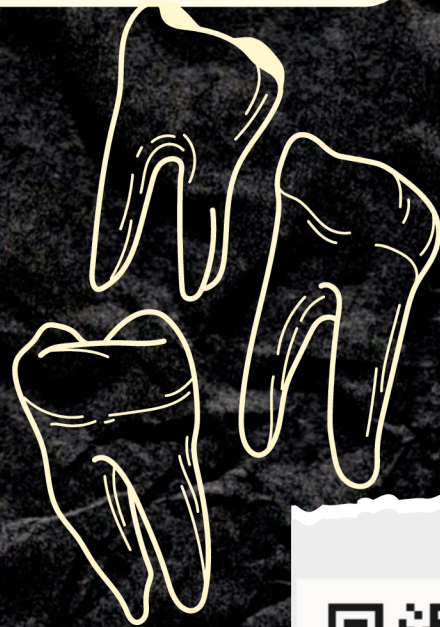


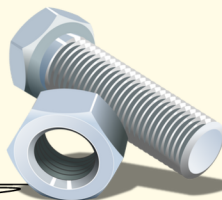
Dr. Ahmed ELshourbagy

ONLINE
DENTAL ACADEMY

Structure Of
Matter



DENTAL
BIOMATERIALS



Structure Of Matter

- Physical , Chemical & Mechanical Properties Depends On :

1- Atomic Structure

2- Type Of Bond

3- Arrangement Of Atoms

Atomic Structure

1- Positive Protons & Neutrons Not Charged

2- Negative Electrons

Type Of Bond (Primary & Secondary)

- **Interatomic (Primary)** : Obtained By

- Receive

- Release

- Sharing

Covalent bond : By Sharing Electrons Like Hydrogen , Acrylic

- Very Directional

Ionic bond :

Electrostatic Attraction Between $+$, $-$

Metallic bond :

Held Together By Cloud Of Free Electrons Because Metals Give Electrons Easily .

(السحابة هي السبب في صفات المعادن مثل الليونة واللمعان)

- **Secondary** :

Physical Weak Bonds Arise From Polarization

- **Fluctuating (Temporary)** : Electrons In One Side Of Nucleus Is More Than The Other Side

- It Is Very Weak Due To Dipole Character (الغازات الخاملة)

- **Permanent Dipole :**

From Electric Imbalance From Sharing Electrons $\longrightarrow$ Hydrogen Bond

- **Interatomic Distance :**

Distance Between The Center Of Two Atom Influenced By

1- Force Of Attraction

2- Force Of Repulsion

- **Factor Affecting IAD :**

1- Temperature $\uparrow$

2- Number Of Atoms $\uparrow$

3- Covalent Bond $\downarrow$

Structure Of Solids

1- **Crystalline :**

- Regular In 3 Dimentions

- Minimum Internal Energy

- Definite Melting Temperature

- Stable - 14 T

- Cubic $\begin{cases} \text{Simple} \longrightarrow 8 \times \frac{1}{8} = 1 \text{ Atom} \\ \text{Body Centered} \longrightarrow 8 \times \frac{1}{8} + 1 = 2 \text{ Atoms} \\ \text{Face Centered} \longrightarrow 8 \times \frac{1}{8} + 6 \times \frac{1}{2} = 4 \text{ Atoms} \end{cases}$

- Iron $\downarrow$ 910 C $^{\circ}$ $\longrightarrow$ Body Centered

- Iron $\uparrow$ 910 C $^{\circ}$ $\longrightarrow$ Face Centered

- Simple Hexagonal $\longrightarrow$ 3 Atoms

- Types Of Crystalline Imperfections :

1- Point Defects

- Vacancy (Missing Atoms)
- Interstitial Impurities (Extra Atoms)

2- Line Defects

- Dislocation (Displacement Of Atoms)

3- plane Defects

- **Polymorphism** : Materials Are Different In Physical Form With The Same Chemical Form .

- **Allotropy** : Inorganic (Crystalline)

- **Isomerism** : Organic (Amorphous)

Reconstructive Transformation	Displasive Transformation
- Break Down Bonds - Need High Thermal Energy - Slow - Irreversible	- No Break Down Of Bonds - Less Thermal Energy - Rapid - reversible

1- Density : Controlled By Atomic Weight , Radius , APF

- Melting T : (Strength Of Bond)

2- Thermal Expansion : Melting T , Strength Of Bond .

3- Thermal , Electrical Conductivity : Nature Of Bond .

4- Strength : Type Of Bond , Arrangement Of Atoms .

5- Sublimation : Transformation Of Solids Directly To Gas .

(من غير ما تعدي علي مرحلة السائل)