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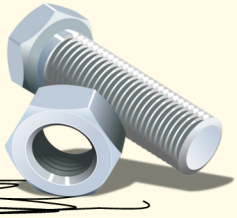
ONLINE DENTAL ACADEMY

Mechanical properties

DENTAL BIOMATERIALS



Mechanical properties

- It Is Describe Material Under Force

- Force → Displacement, Acceleration, Deformation
- Defined By → Speed, Magnitude, Point of application

- Stress: is the internal reaction to the external force

- Axial → Tensile, compressive
- Tangential → Shear, torsion

Stress-Strain curve:

1- Proportional limit: It is the greatest stress the material can withstand without Deviation.

2- Elastic limit: It is the greatest stress the material can withstand without permanent deformation.

3- Yield strength: when material begin plastic.

4- Ultimate strength: maximum stress that the material can withstand without fracture.

5- Modulus of elasticity "E": resistance to the elastic deformation {slope of curve}

-**Flexibility:** The strain that occurs when the material is stressed to its proportional limit.

-**Malleability:** is the ability of the material to be plastically deformed under compression ⟶ \nto thin sheets.

-**Ductility:** the ability of the material to be plastically deformed under tension stress making wires ⟶ fracture by nicking.

-**Brittleness:** \f a material demonstrates no or very little plastic deformation, Fracture of brittle materials occurs by crack propagation, the compressive strength of dental amalgam is about 6 times higher than its tensile.

-**Resilience:** The amount of energy needed to deform the material to its proportional limit, it recovered after remove load.
=Area under straight portion of stress strain curve.

-**Toughness:** \t represents the energy required to stress the material to the point of fracture=Area under elastic & plastic portion.

-**Cantilever Test:** clamping the sample at one end and applying a load at other end.

-**Transverse strength {modulus of rupture}:** subjecting a simple beam supported at each end to a static load at the middle.

e=PL3/4bd3E

- **Diametral compression test:** indirect tensile test used to measure the tensile strength for brittle materials.

- **Fatigue:** Fracture of a material when subjected to repeated (cyclic) small stresses below the proportional limit.

- **Impact strength:** It is the amount of energy required to fracture the material under sudden force. α angle before striking > β angle after striking

- **Hardness:** It is the resistance to permanent indentation, penetration, or scratching

- **Wear:** is the loss of material resulting from mechanical action.

- **Viscoelastic Material:** Strain rate dependent on how fast the material are stressed

- **creep:** Time dependent plastic deformation at stresses at temp. near softening point.

- **Flow** ⟶ Amorphous
- **Sag** ⟶ Metals