Ashur university college lab2 physical properties

Dr. Mohammed Moudhaffer MA

Prosthodontics technology dept.

Physical Properties of Dental Materials

Physical properties include:

1-density

2-thermal properties

3-electrical properties

4-optical properties

Mass- Related Properties

Density: Mass/Volume

It is the mass per unit volume of the material.

Units are gm/cm^3 or pound/in^3

Clinical importance in Dentistry:

1- lightness is nearly always advantageous in retention of the upper denture.

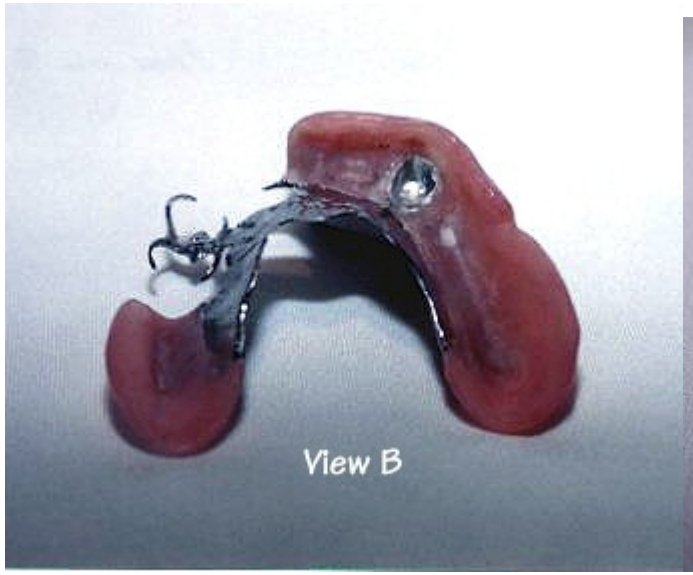
2- Weights of tin and leads were added to control the mobility of lower complete and partial dentures.

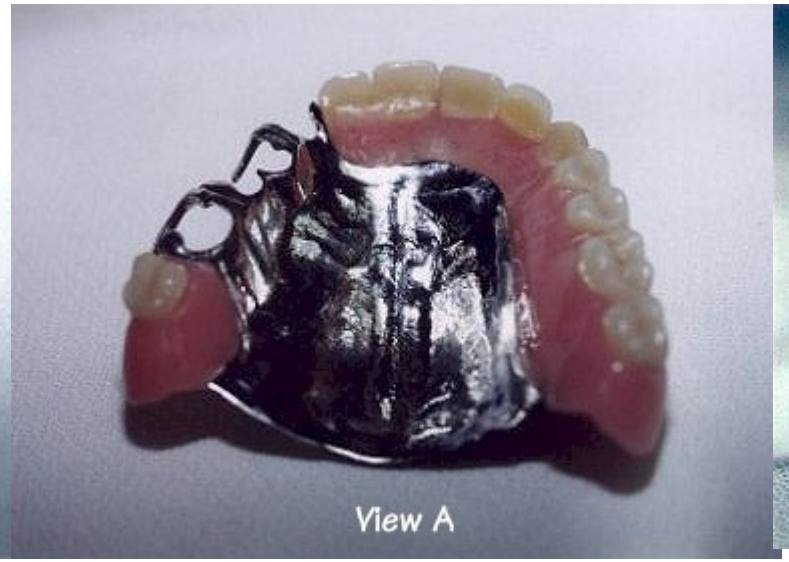


Complete Denture

Importance in dentistry:

1) **Upper denture must be made up of the materials that are of low density to help its retention. Metals are heavier than acrylic.**







Thermal Conductivity:

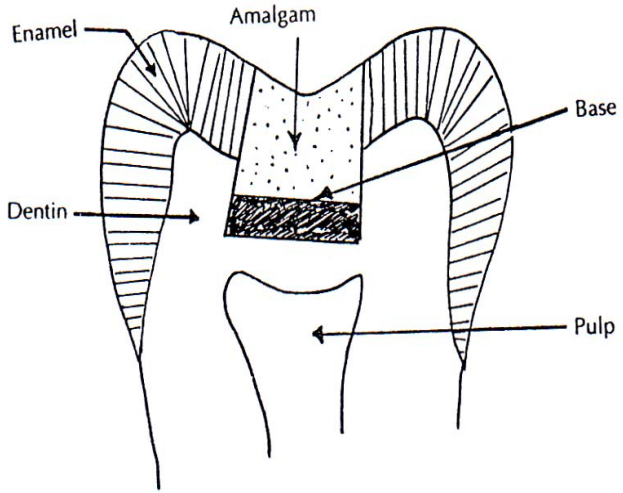
It is the amount of heat in calories or joules passing per second through a body 1cm thick, 1cm^2 cross sectional area when the temperature difference is 1°C

Unit cal/sec/cm/(°C/cm$^{2)}$

Clinical importance in Dentistry:

1- Metallic filling materials like amalgam sometimes cause pulp pain by transmitting heat and cold than the natural tooth especially in deep cavities thus they require heat insulating layer between the pulp and the filling materials





Amalgam filling Insulation (calcium hydroxide)





2- Metallic denture base materials is an advantages as it gives feeling closer to the normal condition and the patient will feel normal also it will protect him from drinking very hot drinks which may burn his mouth.



3- Coefficient Thermal of expansion(α)

The change in length per unit length of the material for a 1°C change in temperature is called the linear coefficient of thermal expansion(α)

$$\alpha = \frac{L_{final} - L_{original}}{L_{original} \times (°C_{final} - °C_{original})}$$

Unit is: / °C or Cm/Cm.C◦

$$\alpha = \frac{L_{final} - L_{original}}{L_{original} \times (C_{final} - C_{original})}$$

Examples:

Enamel = 11 x 10-6/°C

Gold = 14 x 10-6/°C

Composite = 22 x 10-6/°C

Impression compound = 250 x 10-6/°C

Electrical properties: (electrical conductivity and resistively)

The ability of a material to conduct an electric current may be stated as either specific conductivity or conversely as the specific resistivity, where resistivity is the resistance of a material electric current of one cm length and a cross – sectional area of one cm^2.

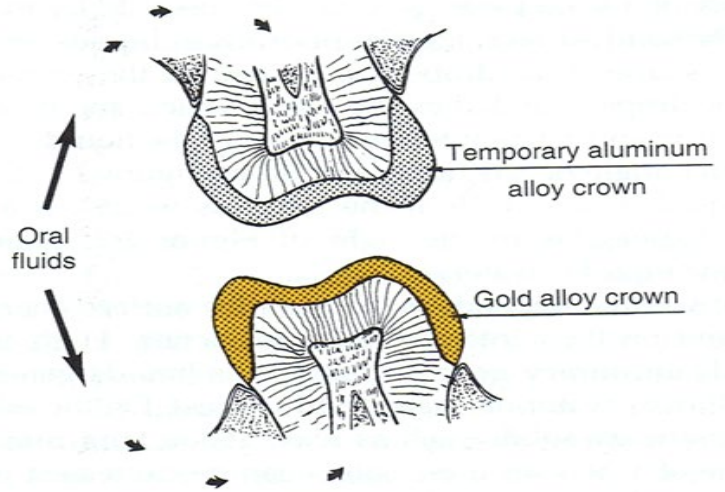


FIGURE 2–1 Diagrammatic sketch of opposing teeth with a gold crown and a temporary aluminum alloy crown indicating how galvanism can occur.

Dimensional stability:

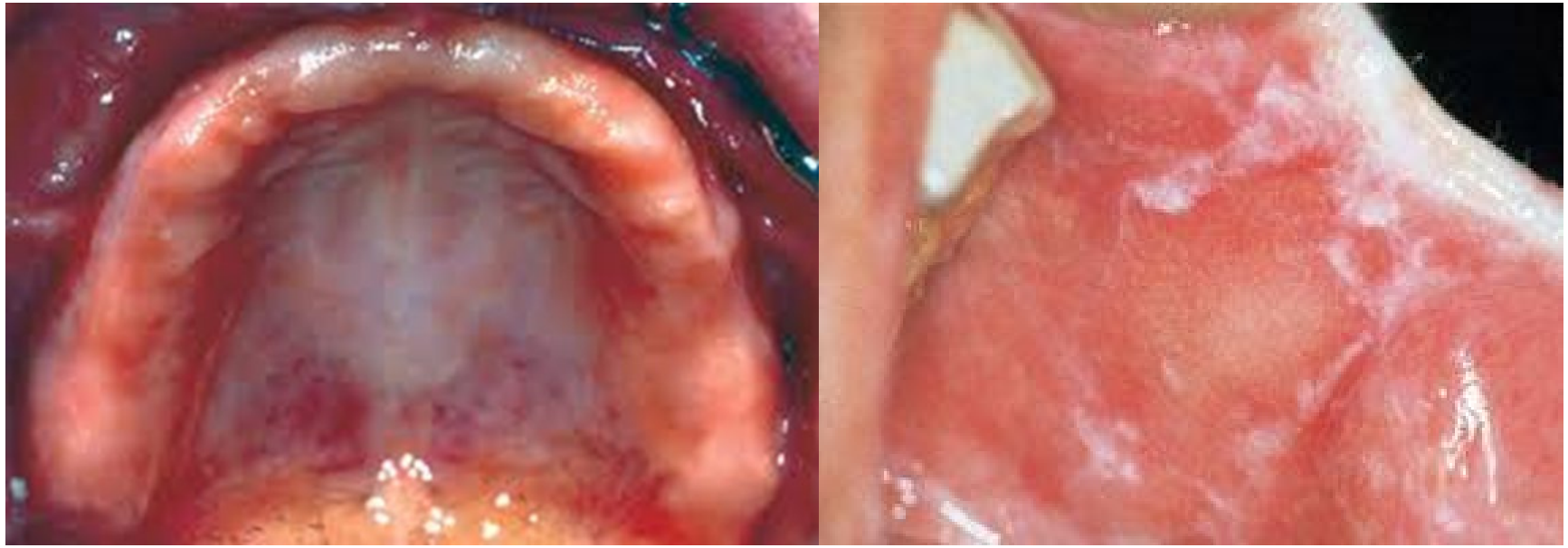
Many material change shapes when they set or harden. Impression materials should not change dimensions when set. Also, dental materials should have no dimensional changes after setting.





Tissue reaction

- **Dental materials should not show any allergic reaction to the tissue and also should not provide good culture to the growth of bacteria and Candida albicans to grow and cause infection like soft lining materials.**

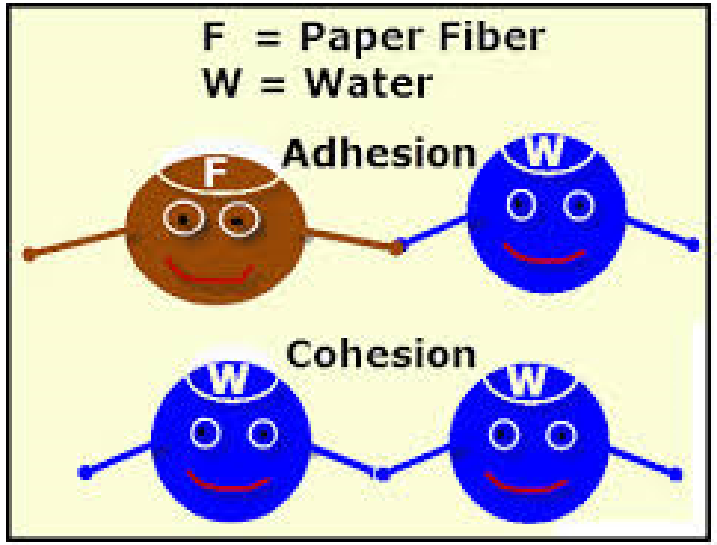


Solubility

- **Restorative materials should not dissolve in the mouth and if its dissolves, it should no release toxic substances.**
- **Solubility of silicate = 0.7-1.6%.**
- **Solubility of composite = 0.01%.**

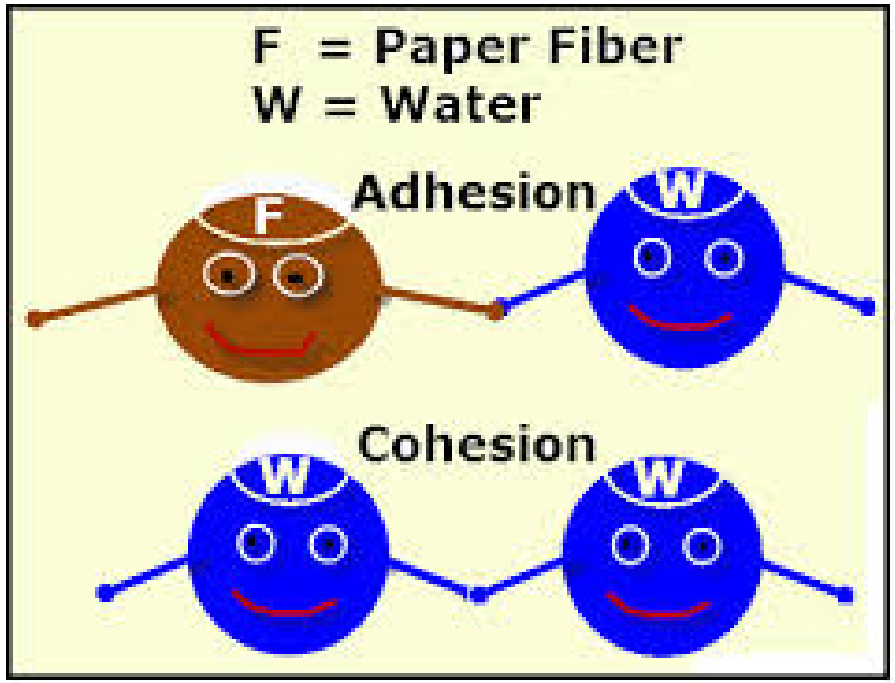
Adhesion

- **The bonding of dissimilar materials when they are brought into contact with each other by either:**
  - **^ Chemical bonding (True) OR**
  - **^ Mechanical bonding (retention).**



Cohesion

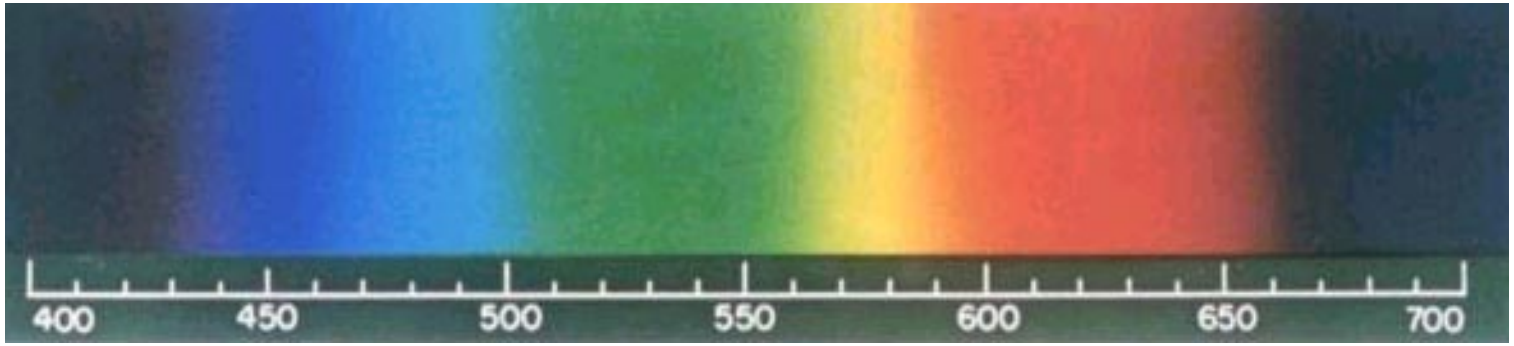
- **The bonding of similar materials when they are brought into contact with each other by either:**



Optical Properties

The perception of the Color of an object is the result of a physiological response to a physical stimulus (light).

Light is an electromagnetic radiation that can be detected by the human eye. It can be seen that the visible electromagnetic radiation is in the range from 400-700 nanometers.



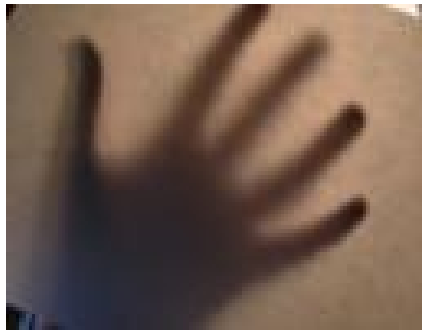
Translucency

is a property of the material, which allows the passage of some light and scatters or reflects the rest . In such manner, the object cannot be clearly seen through them

Translucency decreases with increasing the scattering centers.

e.g. tooth enamel, porcelain, composite and pigmented acrylic resin.





Fluorescence: It is the emission of light by a material when a beam of light is shone on it. It makes the teeth bright and vital, as it increases the brightness. *Anterior teeth restoration*





Thank you