Dental Material

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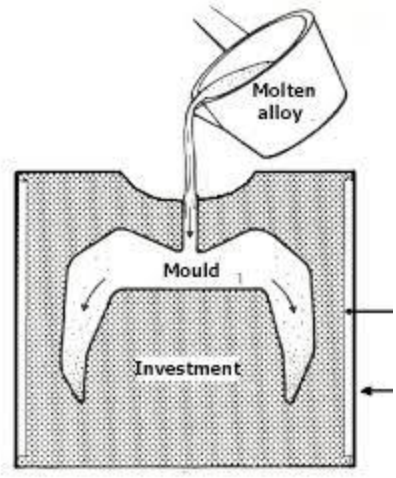
Lecture 4

Investments materials

Investing: This is a process of surrounding the wax pattern with a suitable investment material to accurately duplicate the wax pattern's shape and anatomical contour.

When a restoration or appliance is being made by a “lost wax” process, the wax pattern is embedded in an investment material. After the investment material has set, the wax is removed by burn out process, that creates a space in the investment called as mold space, which is filled by the material of which the restoration or appliance is to be made.



Requirements of Investment Materials:

1. Easily manipulated: Not only should it be possible to mix and manipulate the mass readily and to paint the wax pattern easily, but the investment should also harden within a relatively short time.

2. The material for making the mold must be refractory and thermally stable so that it can withstand exposure to the high temperatures of molten metal as the metal solidifies and cools to room temperature.

3. Sufficient expansion: It must expand enough to compensate for shrinkage of the wax pattern and metal that takes place during the casting procedure.

4. Ease of divestment: The investment should break away readily from the surface of the metal and should not have reacted chemically with it.

Composition of Investment Materials: In general, an investment is a mixture of three distinct types of materials:

1. Refractory material.

2. Binder material.

3. Other chemicals.

According to the types of silica (Refractory material) used:

1. Quartz investments
2. Cristobalite investments

According to the types of binders used:

1. Gypsum Bonded Investment (G.B.)

2. Phosphate Bonded Investment (P.B)

3. Silica Bonded Investment (S.B.)

According to the use and melting range alloy:

1. **Gypsum Bonded Investment (G.B.)**

They are used for casting gold alloys.

They can withstand temp up to 700 C°.

Type I: For casting inlays\ crowns.

Mode of expansion: Thermal

Type II: For casting inlays\onlays\crowns.

Mode of expansion: Hygroscopic.

Type III: For partial dentures with gold alloys

2. **Phosphate Bonded Investment (P.B)**

For alloys used to produce copings or frameworks for metal-ceramic prosthesis, pressable ceramic.

Divided into 2 types

Type I: For inlay, crowns, and other fixed restorations.

Type II: For partial dentures and other casts, removable restorations.

3. **Silica Bonded Investment (S.B.)**

Use principally in casting of partial dentures in the base metal alloy.

Types of Expansion of Investment Material

1. Normal setting expansion, this will occur with investment during the change from the fluid state to the solid state. The percentage of this type is (0.034-0,4%) it occurs when the investment becomes hard as a result of crystallization.

2. Hygroscopic setting expansion. In this case, the investment set after is put in a water bath of 35C and the amount of this type of expansion is 0.35% occurs only in (G.B.) investment.

3. Thermal expansion, occurs during the burn-out procedure, due to heating the investment in the oven and it's about 1.45%.

<u>Expansion varies according to the:</u>

1- Investment formula.

2- Water/ powder ratio.

3- Increase spatullation both in rate and time.

- Aging & storage.

Soldering investment: It is composed of **quartz** and **calcium sulphate hemihydrates binder for low melting point alloys.**

For high melting point alloys phosphate bonded investment should be used.

Soldering investment should have lower setting and thermal expansion than casting investment. They are made of ingredients that do not have as fine particles size as casting investment