

Dental Material

Gypsum products

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Lec. 6

الكورس الثاني

المرحلة الاولى

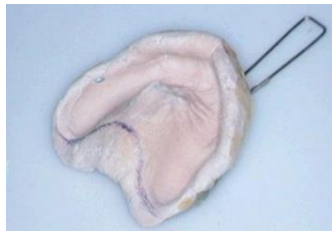
Gypsum products

Introduction

Products of gypsum are used widely in dentistry. At first, Gypsum was found in mines around the city of Paris, so it is also called *plaster of Paris* and then gypsum is found in most countries. The mineral gypsum $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ is usually white to yellowish white in color.

Applications in dentistry

1. Impression plaster used for impressions of the mouth, for the edentulous (toothless) ridges



2. used to make molds, casts and dies for making restorations.



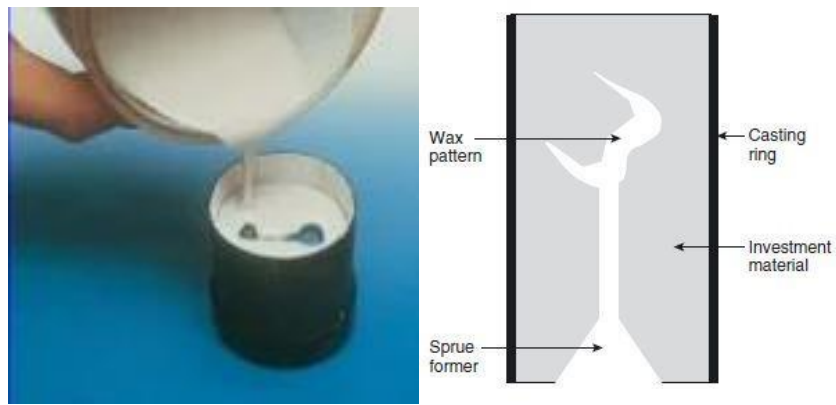
3. To attach casts to an articulator



4. Molds for processing dental polymers.



5. Dental investments: when plaster is mixed with silica it is known as dental investment. They are used to form molds for metal casting.



Properties of ideal model material

1. Dimensional stability.
2. High strength.
3. Hardness.
4. Reproduce the fine details.
5. Produce smooth surface.
6. Reasonable setting time.
7. Compatible with impression materials.
8. Can be disinfected.

Types of gypsum products

Type 1: Dental plaster for impressions

Type 2: Dental plaster for mounting or for models

Type 3: Dental stone for models

Type 4: Dental stone (high strength, low expansion) for dies

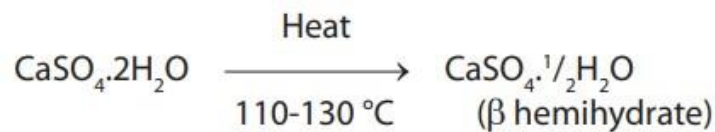
Type 5: Dental stone (high strength, high expansion) for dies

Manufacture of gypsum products

calcination it is a process of heating gypsum to produce plaster.

- Mined gypsum is ground and heated. When heated, gypsum (calcium sulphate dihydrate) ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) loses part of its water and changes to calcium sulphate hemihydrate ($\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$).

Manufacture of dental Plaster: it is produced by heating gypsum in open container to (110 – 130 C) which loses water to form plaster ($\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$). The crystals of plaster are irregular in shape and porous called **Beta-hemihydrate**.



W/P ratio (water/powder)

The powder is mixed with water at a certain ratio according to the type of gypsum product, W/P ratio for plaster is 0.5 that is 50 ml of water for 100 gm of plaster powder. W/P ratio for stone is 0.3, W/P ratio for die stone is 0.2, The difference in the W/P ratio is due to the difference in the bulk volume of the powder. The water is measured and put in a clean rubber bowl then the powder is added on it gradually, allow the powder to settle then mix with clean spatula for 1 min. until creamy mix is obtained.

Factors affecting the setting time:

1. W/P ratio: The more water is used for mixing, the setting time will be prolonged.
2. Fineness: The finer the particle size of the hemihydrate, the faster the mix will harden.
3. Mixing: The longer and more rapidly the plaster is mixed, the shorter is the setting time.
4. Temperature: There is little change in the setting time between 0 – 50 °C but if the temperature exceeds 50 °C the setting time will be retarded. As the temperature approaches 100°C, no setting will take place.
5. Impurities: If the manufacture adds them to gypsum, the setting time will be shortened ex: additives.
6. Retarders & accelerators:

Retarder is the chemical material added to the gypsum product to increase the setting time ex. Glue, Borax, and Gum Arabic.

Accelerator is the chemical material added to the gypsum product to decrease the setting time ex. Sodium Chloride and Potassium Sulfate in a certain concentration.