Gypsum Products

Aim:

- To grasp the importance of Gypsum products in modern day dentistry

Objectives

- Types and composition.
- Uses
- Manipulation.
- Specs.

Definitions

- Model
- Cast
- Die

Chemical composition

- Calcium sulphate.
- CaSO$_4$·2H$_2$O
  - Dihydrate form naturally occurring
- When heated it becomes hemihydrate

Composition

- β-hemihydrate – ‘dental plaster’ consist of large irregularly shaped orthohombic crystal particles with capillary pores
- α-hemihydrate – ‘die stone or improved stone’ consist of small regularly shaped crystalline particles in the form of rods or prisms
- α-modified hemihydrate– boiling gypsum in 30% aqueous solution of CaCl & MgCl. Chloride is then washed away to yields smoothest, most dense powder particles
Types:
• ADA Specification #25
• – Type I “Impression Plaster”
• – Type II “Model Plaster”
• – Type III “Dental Stone”
• – Type IV “Die Stone, Low Expansion”
• – Type V “Die Stone, High Expansion”

How dental models can be formed

Mixing water with hemihydrate.

\[
\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O} + 1.5 \text{H}_2\text{O} \rightarrow \text{CaSO}_4 \cdot 2\text{H}_2\text{O} + \text{heat}
\]

So what type of reaction is this?

Minimum reactive water is 18.61gm for 100gms.
• “Gauging Water” is the un-reactive water that ensure workability and result in porosity.

• Type I – 100g/40-75ml
• Type II - 100g/45-50ml
• Type III – 100g/28-30ml
• Type IV – 100g/22-24ml
• Type V – 100g/18-22ml

Mechanism of setting
• Crystalline theory.
• Dissolution  Precipitation theory.
• Thrusting action during the growth of gypsum from the supersaturated solution.
**Temperature effect**

- 0 ° – 50 ° No Change in reaction
- 50 ° – 100 ° Gradually retardation
- 100 ° – 110 ° Reaction start to reverse

**Spatulation effect**

**Spatulation effect**

- Retarder – Borax, Potassium Citrate, NaCl 20%
- Accelerators – Gypsum, Potassium Sulfate, NaCl 28%

**Setting Expansion**

- Crystallization mechanism
- Increase expansion
  - Lower W/P ratio
  - Longer mixing
- Decrease expansion
  - Potassium sulfate, NaCl, Borax

**Homework?**

- Hygroscopic Setting Expansion

**Homework?**

- Type I Gypsum
- “Impression Plaster”
- Percentage of expansion 0.15%
- Mounting Cast, Provisional Cast
- Soldering indexes
Type II Gypsum
- “Modeling Plaster”
- Percentage of expansion 0.30%
- Orthodontics Diagnostic Cast

Type III Gypsum
- “Dental Stone”
- Percentage of expansion 0.20%
- Diagnostic Cast, Opposing Arch Cast, and Removable Prosthodontics
- “Yellow Stone”, “Microstone”

Type IV Gypsum
- “Die stone, Low Expansion”
- Percentage of expansion 0.10%
- “Densite or Improved Dental Stone”
- Dies for Crown, Bridge, and Implant
- Cast for cast post

Type V Gypsum
- “Die Stone, High Expansion”
- Percentage of expansion 0.30%
- “Densite or Improved Dental Stone”
- Dies for Crown and Bridge

Manipulation
- Proper Water/Powder ratio minimized gaging
- water
  - Prepackaged Envelopes
  - Measure water with glass cylinder
  - Powder is added to the Water
  - Vacuum Mixing
  - Mixing Time
  - Pouring impression with vibration device
  - Compression Strength plateau at 24 hour

Manipulation
- Mixing time
- Working time
- Setting time
• Thank you