INTRODUCTION TO GYPSUM PRODUCTS

DENT105, Dental Anatomy and Morphology

Stephen C. Bayne
Department of Operative Dentistry
School of Dentistry
University of North Carolina
Chapel Hill, NC 27599-7450

http://www.dent.unc.edu/portfolios/bayne/dental-materials/

GYPSUM

Product Use in Dentistry

GYPSUM = calcium sulfate = naturally occurs as dihydrate
Heat removes water and converts dihydrate to hemihydrate.

[D gypsum Powder] + [H2O] ↔ [Gypsum] + [Heat]
Calcium Sulfate Hemihydrate

DIRECT versus INDIRECT PROCEDURES

Dental Amalgam
Dental Amalgam
Inlays, Onlays, Crowns, and Bridges
Partial and Full Dentures
Temporary Appliances

GYPSUM PRODUCTS:

• Plaster
• Stone, Cast Stone
• Improved Stone, Die Stone
• Specialty Stones
• Investment Materials

http://www.whipmix.com

GYPSUM Setting Reaction

[Gypsum Powder] + [H2O] ↔ [Gypsum] + [Heat]

Accelerators
[CaSO4·(1/2)H2O] + [3/2H2O] ↔ [CaSO4·(2)H2O] + [Heat]
Calcium Sulfate Hemihydrate
Calcium Sulfate Dihydrate

Whip Mix Corporation
PO Box 17183
Louisville, KY USA 40217-0183

GYPSUM Setting Mechanism

Dissolution of hemihydrate
Precipitation of dihydrate
Crystal expansion and interlocking

Working Cast
Orthodontic Model
Working Cast

Removable Die with Waxed Inlay

EDENTULOUS CAST
ORTHODONTIC MODEL
WORKING CAST

Working Time
Setting Time

LOSS OF GLOSS

LARGE Gilmore Needle
SMALL Gilmore Needle

Dental Amalgam
Inlays, Onlays, Crowns, and Bridges
Partial and Full Dentures
Temporary Appliances

http://www.dent.unc.edu/portfolios/bayne/dental-materials/
**MANUFACTURE of Dental Gypsum**

**PLASTER**
- Chemical Name: Calcium Sulphate $\beta$-Calcium Sulphate $\alpha$
- Formula: $CaSO_4\cdot(1/2)H_2O$
- Powder Shape: Irregular
- Density: Porous
- Production Steps: Heat to 115°C in air
- Common Names: Plaster, Impression Plate (Plaster of Paris)

**STONE**
- Chemical Name: Calcium Sulphate $\alpha$
- Formula: $CaSO_4\cdot(1/2)H_2O$
- Powder Shape: Uniform
- Density: Dense
- Production Steps: Heat to 125°C with steam pressure in CaCl & H2O
- Common Names: Stone, Investment (Hydrocal)

**DIE STONE**
- Chemical Name: Calcium Sulphate $\alpha$
- Formula: $CaSO_4\cdot(1/2)H_2O$
- Powder Shape: Uniform
- Density: Dense
- Production Steps: Heat to 100°C
- Common Names: Die Stone (Densible)

**PROPERTIES of Gypsum Products**

<table>
<thead>
<tr>
<th></th>
<th>PLASTER</th>
<th>STONE</th>
<th>DIE STONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting Time:</td>
<td>11 min</td>
<td>7 min</td>
<td>6 min</td>
</tr>
<tr>
<td>Setting Expansion:</td>
<td>0.20%</td>
<td>0.10%</td>
<td>0.05%</td>
</tr>
<tr>
<td>Min. Crushing Strength:</td>
<td>1,000 psi</td>
<td>3,000 psi</td>
<td>5,500 psi</td>
</tr>
<tr>
<td>Porosity:</td>
<td>25%</td>
<td>20%</td>
<td>10%</td>
</tr>
</tbody>
</table>

**MANIPULATION of Gypsum Products**

- Proportion P and L
- Microstone
- Bulk P
- Pre-packaged P
- Transfer to impression

**INFECTION CONTROL Procedures for Gypsum Products**

Infection Control Approaches (Strategies):
- Additives in "impression material"
- Immersion of "impression material" surfaces
- Additives in "gypsum products"
HAVE FUN!

THANK YOU