Elastomeric Impression Materials

Elastomeric impression materials

- *Liquid polymers when mixed with a suitable catalyst are converted into solid rubber at room temperature.*

Terminology:

- ***Polymerization:*** chemical reaction that transforms small molecules into large polymer chains.
- ***Addition reaction:*** Polymerization reaction in which each polymer chain grows to maximum length in sequence and there is no by-product.
- ***Condensation reaction:*** Polymerization reaction in which the polymer chains all grow simultaneously and by-product is formed.
- ***Cross-linking:*** the reaction that links or joins polymer chain to form a network structure.

Types of Elastomeric impression Materials

I)According to Chemistry

- Polysulphide
- Polyether
- Silicone
- Additional polymerizing silicone
- Condensation polymerizing silicone.

II)According to **Viscosity**

The elastomeric impression materials are available in a range of viscosities, depending on the amount of filler that is incorporated

- Light body or syringe consistency.
- Medium or regular body.
- Heavy body or tray consistency.
- Very heavy or putty consistency

SUPPLIED AS :-

- *All elastomers –two paste systems(base and catalyst)*
- *Putty consistency – supplied in jars*

USES :-

1-Impressions of prepared teeth for fixed partial dentures.

2- Impression for removable partial dentures.

3- Impression of edentulous mouth for complete dentures.

4- Polyether is used for border molding of special tray.

5- For bite registration.

6- Silicon duplicating material is used for making refractory cast.

Polysulfide

(Synonyms : Mercaptan, Thiokol rubber)

- *First elastomeric impression to be introduced*
- *Available in low, medium and high consistencies*

Composition

Polysulfide polymer - 80 to 85%

Fillers - 16 to 18%

Titanium dioxide, zinc sulfate, copper carbonate or silica

BASE PASTE

Lead dioxide; 60 to 68%

Dibutyl phthalate (30- 35 %)

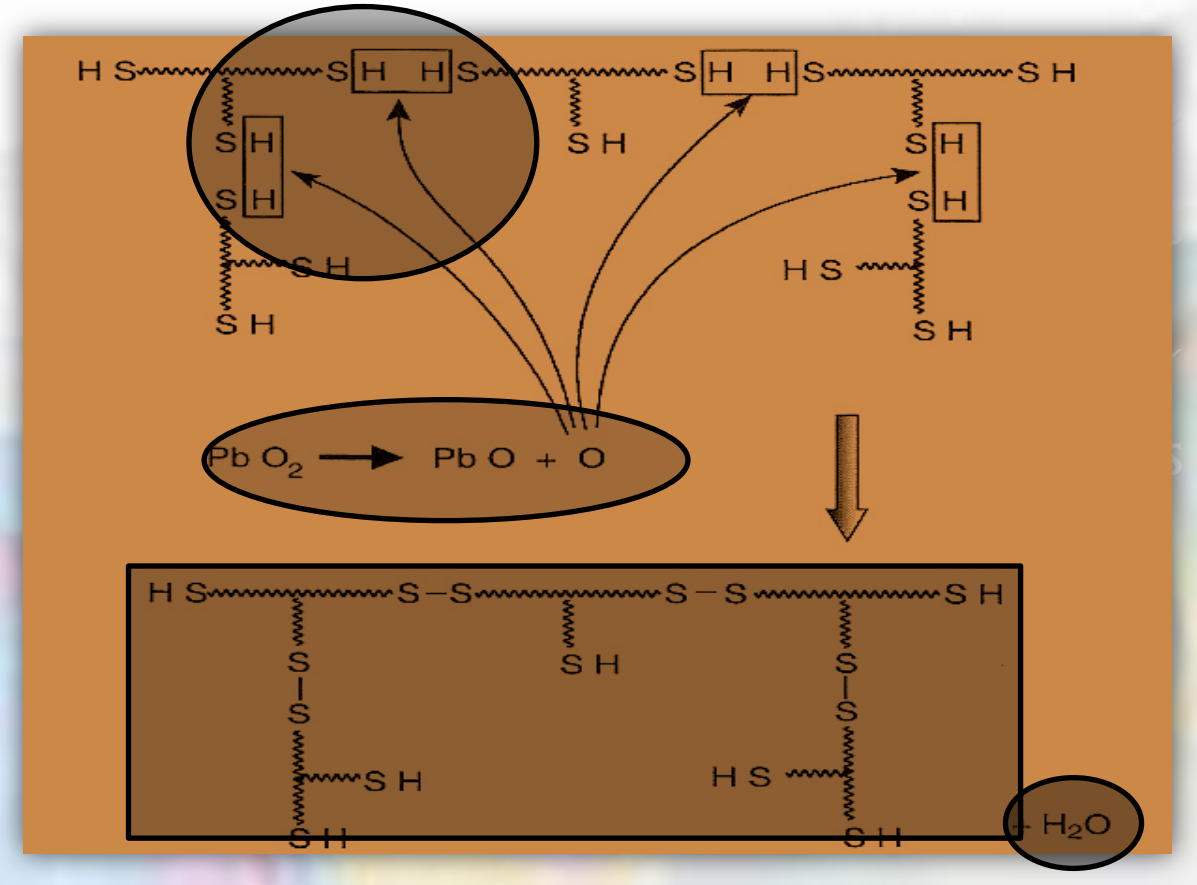
Sulfur. (3 %).

Other substances like (deodorant, and magnesium stearate (retarder)

(2 %)..

Catalyst PASTE

Setting reaction



Lead dioxide + Polysulfide polymer → Polysulfide + water

Δ 3 to 4°C

Properties

- Setting time: 12 min
- Good flexibility
- High tear strength
- Hydrophobic

- It has highest permanent deformation .among the elastomers, so pouring of the cast should be delayed by half an hour. Further delay is avoided to minimize curing shrinkage, and shrinkage from loss of by-product (water).
- Require custom tray. The tray is painted with adhesive.

DISADVANTAGES

- Unpleasant odor
- High shrinkage on setting.
- High amount of effort required for mixing.
- Stains clothing & messy to work with
- High permanent deformation.

Polyether Rubber Impression Material

Polyether

- Introduced in Germany in late 1967s
- Good mechanical properties and dimensional stability

Composition

Poly ether polymer

Fillers; colloidal silica

Glycoether or phthalate; plasticizer

- Base paste

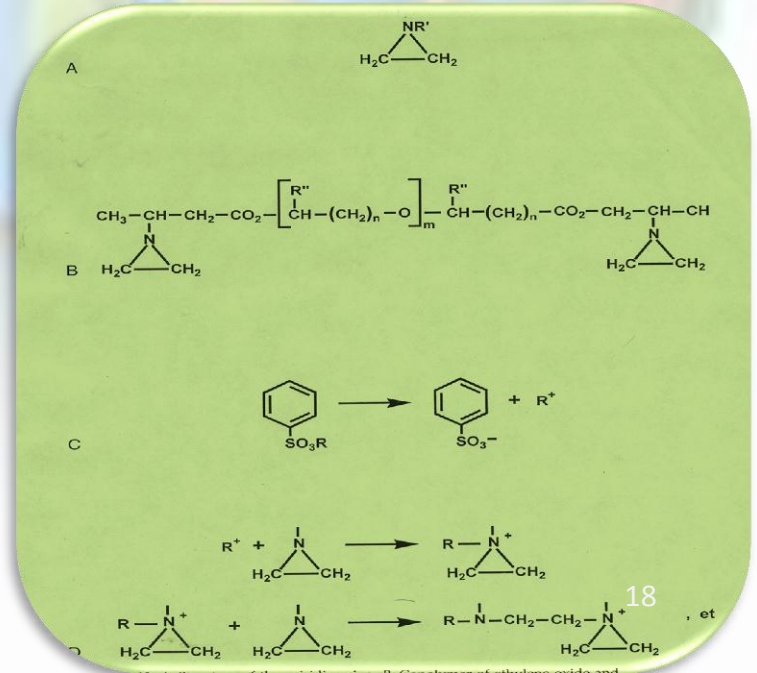
Alkyl – aromatic sulfonate ester; cross linking agent

Fillers and plasticizers

- Accelerator paste

SETTING REACTION

Polyether + Sulfonate ester = Cross linked rubber



PROPERTIES

1. Pleasant odor and test.
2. The sulphonic ester may cause skin reaction.. direct skin contact should be avoided.
3. It is extremely stiff (flexibility 3 %). Its hardness is higher than polysulfide and increase with time. Care should be taken while separation of cast from impression to void any breakage.

PROPERTIES

4-Setting time is around (3minutes), heat decrease setting time.

5-Dimensional stability is very good. Polymerizing shrinkage is low. The permanent deformation is low (1-2 %). The impression should not be stored in water or in humid climate, because polyether absorb water and can change dimension.

6-The tear strength is good

7-It is hydrophilic, so moisture in the impression field is not so critical. It has the best compatibility with stone.

DISADVANTAGES

It is expensive

The working time was short.

The material was very stiff.

Siliconas


Zetaplus
Zetaplus SOFT
Thixoflex M
THIXOTROPIC HYDROCOMPATIBLE
Oranwash L
LIGHT HYDROCOMPATIBLE
Oranwash VL
VERY LIGHT HYDROCOMPATIBLE
Indurent Gel

Condensation Silicone

- this was the earlier of the two silicone impression materials. It is also known as conventional silicone.
  Available as:
  1- Light body.
  2- Putty consistency.
- **Application**

Condensation silicon impression materials are commonly used for crown and bridge and occasionally for partial denture.

Composition

Polydimethyl siloxane

Colloidal silica or metal oxide(filler) 35-75%

Color pigments

BASE PASTE

Ortho ethyl silicate-cross linking agent

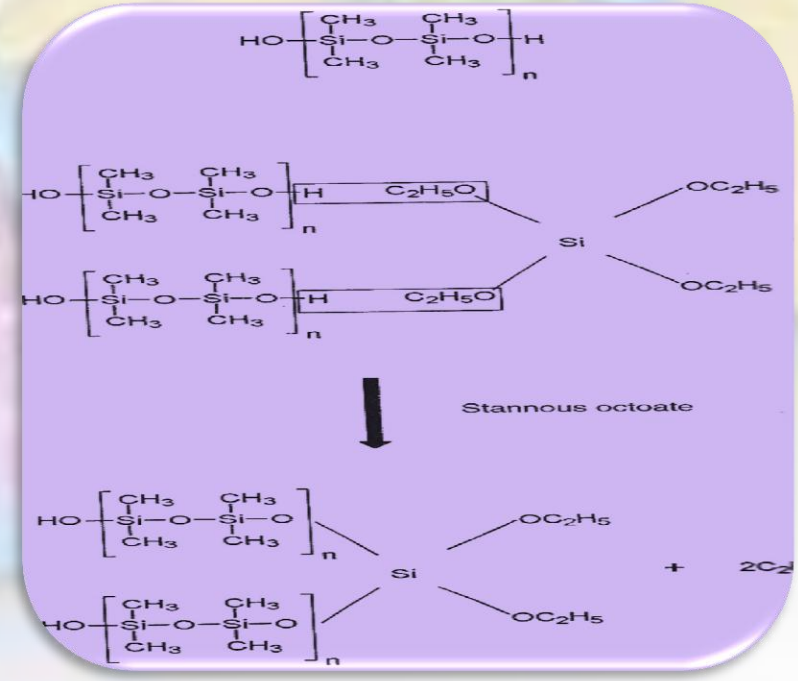
Stannous octoate - catalyst

Catalyst PASTE

SETTING REACTION

Dimethyl siloxane + Orthoethyl silicate —(Stannous octate)→ Silicone rubber + Ethyl alcohol

Δ 1



Cross linkage between Orthoethyl silicate and the terminal hydroxyl group of Dimethylsiloxane to form a 3 Dimensional network

properties

- Pleasant color and odor.
  Setting time: 6-8 min
- The ethyl alcohol formed evaporates gradually leading to shrinkage & instability. So a condensation silicone should be poured as soon as possible after removal

- Excellent reproduction of surface details.
- The tear strength is lower than polysulfide. It is stiffer and harder than polysulfide, care should be taken while removing the stone cast from the impression to avoid any breakage.

- It is hydrophobic.
- Direct skin contact should be avoided to prevent any allergic reactions.

Addition silicone

Also known as polyvinyl siloxane

Has better properties than condensation silicones

- Available in 4 consistencies
  - Light body
  - Medium body
  - Heavy body
  - Putty

Composition

Poly methyl hydrogen siloxane

Other siloxane prepolymers

Fillers-

- Base paste

Divinyl polysiloxane

- Other siloxane prepolymers

Platinum salt: Catalyst

(*Palladium (Hydrogen absorber)*

- Retarders

- Fillers

- Catalyst paste

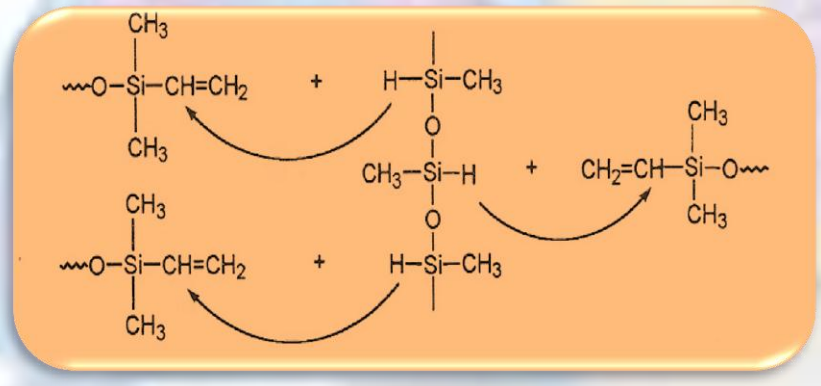
Setting reaction

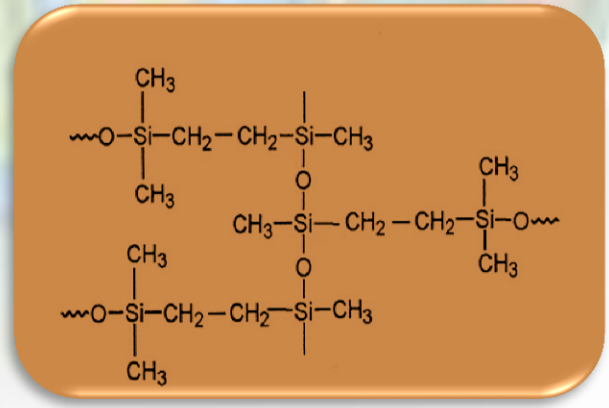
Vinyl siloxane

Platinum salt

Hydrogen siloxane

Silicone rubber





The base polymer is terminated with vinyl groups and is cross linked with hydride groups

Properties

1- Pleasant color and odor.
2- Direct skin contact should be avoided to prevent any allergic reactions.
3- Excellent reproduction of surface details.
4- Setting time is 5-9 minutes.
5- It has the best dimensional stability among the elastomers. It has low polymerizing shrinkage, and the lowest permanent deformation (0.05-0.3 %). The cast pouring should be delayed by 1-2 hours; because of hydrogen gas is liberated during polymerization, air bubbles will result.
6- It hydrophobic, so similar care should be taken while making the impression and pouring the wet stone. Some manufactures add a surfactant (detergent) to make it more hydrophilic.
7- It has low flexibility and it harder than polysulfide; care should be taken while removing the stone cast from the impression to avoid any breakage.

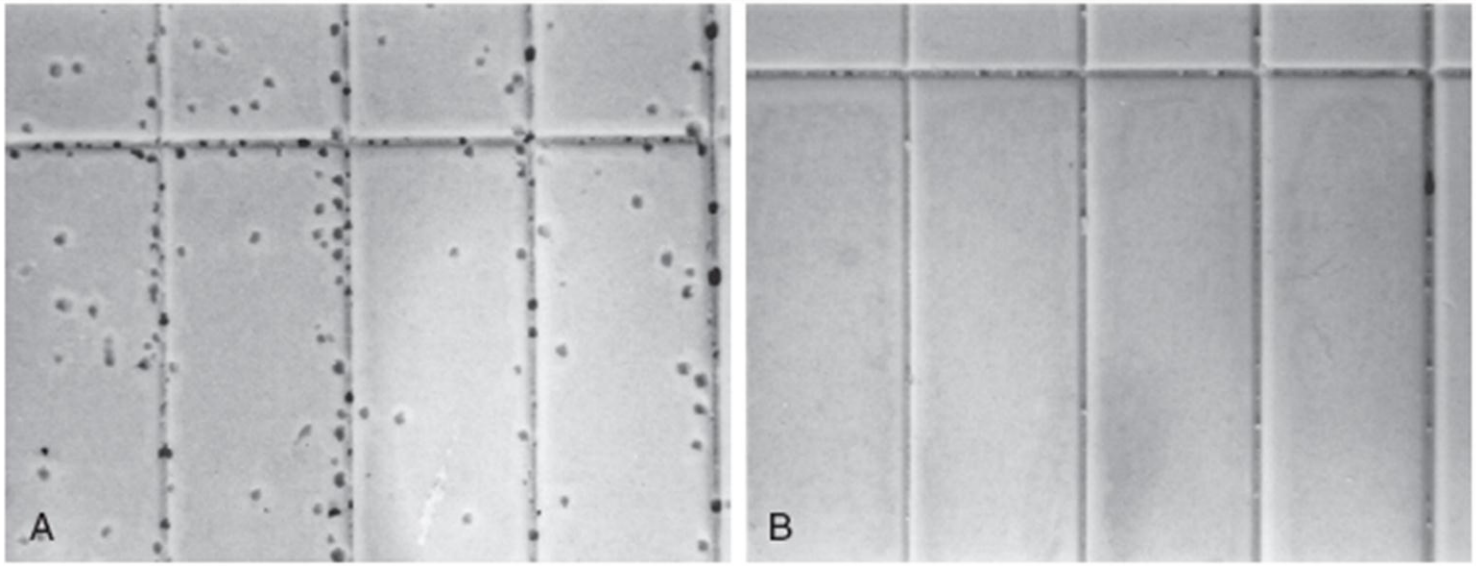


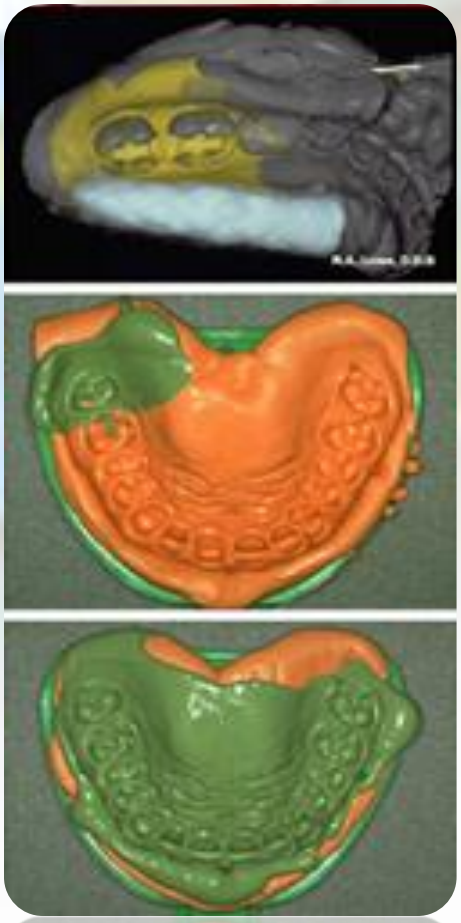
FIGURE 12.12 **Addition-silicone impressions poured in high-strength stone at 15 minutes. A,** Bubbles are caused by the release of hydrogen. **B,** No bubbles are apparent because palladium hydrogen absorber is included in the impression material.

- 8-Sulfur contamination from natural latex gloves inhibits the setting of addition silicone.

  Prevention :-

- *- Use vinyl or nitrile gloves to eliminate the problem*

IMPRESSION TECHNIQUES



Manipulation methods

- Hand mixing
- Static auto mixing
- Dynamic mechanical mixing

1-SINGLE MIX TECHNIQUE

- **Tray used**: spaced special tray.
- **Viscosity used**: regular body only.

Method

The paste is mixed and material is loaded onto the tray, the tray with material is seated over the impression area, the material is allowed to set.

SINGLE MIX TECHNIQUE

Only one mix is

•spaced special tray.

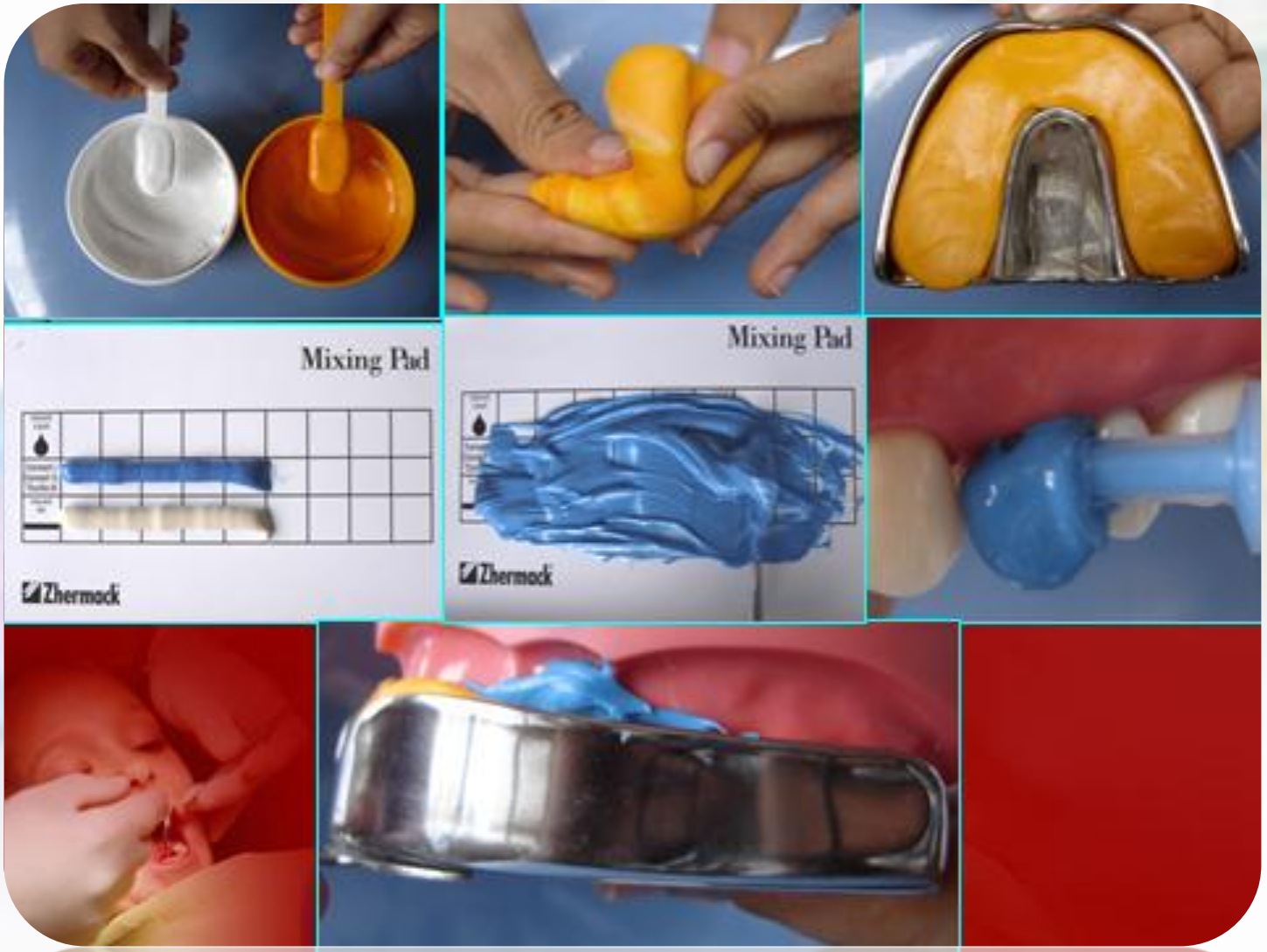
- **Viscosity used**: regular body only.

Method

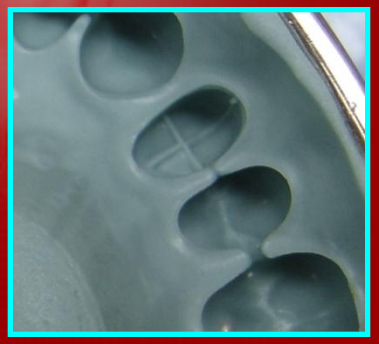
The paste is mixed and material is loaded onto the tray, the tray with material is seated over the impression area, the material is allowed to set.

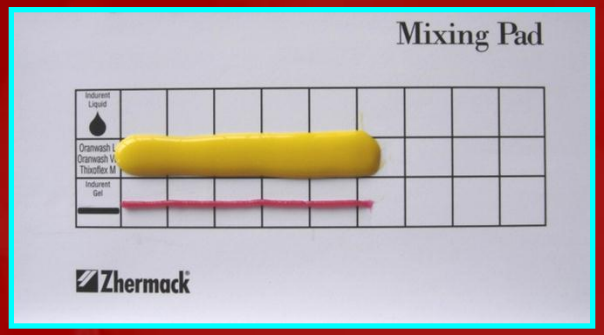
2-Double mix technique-

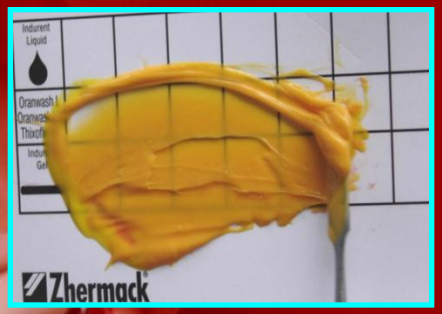
- **Tray used**: spaced special tray.
  - Viscosity used: (a) heavy body and (b) light body.

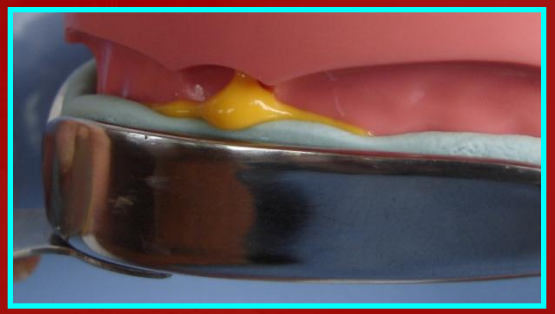


PUTTY -WASH TECHNIQUE

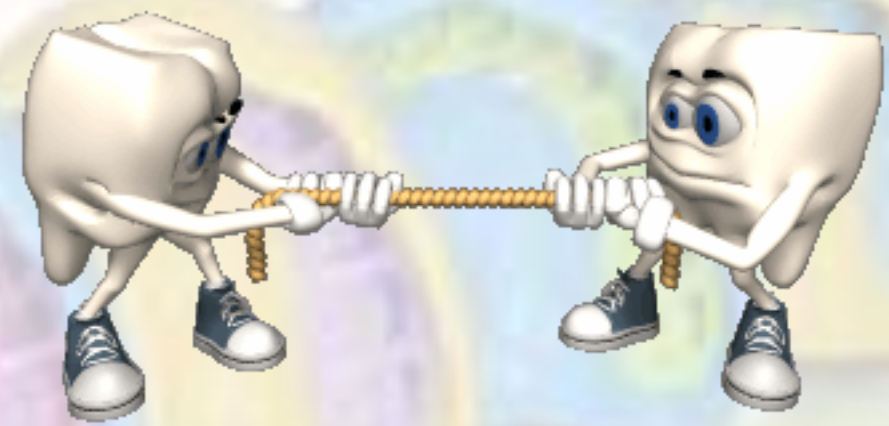



Mixing Pad
Zhermack


Zhermack

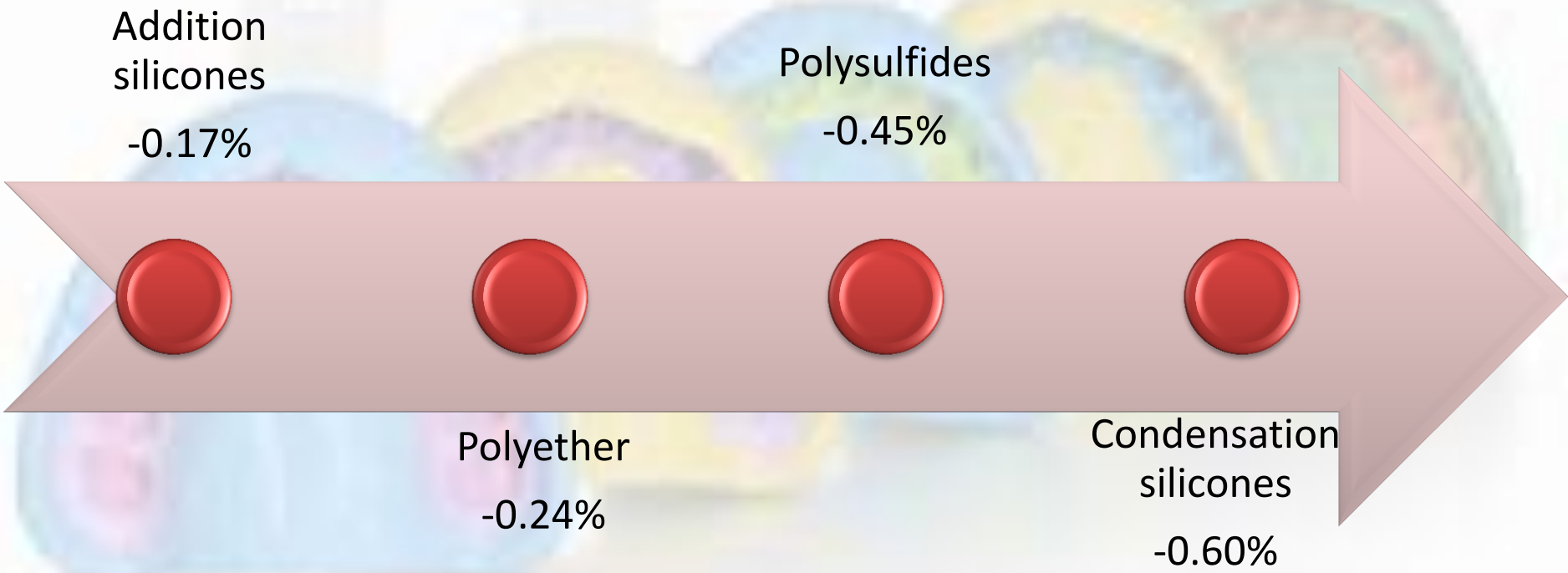


Comparisons



POLYSULFIDE Vs SILICONE Vs POLYETHER

Dimensional change



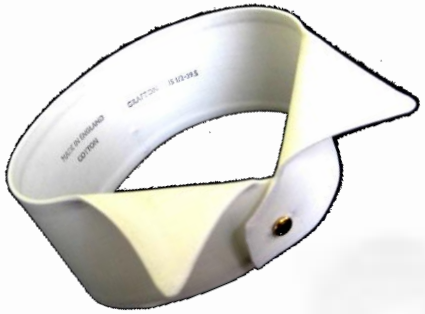
Permanent deformation

Addition silicones

Condensation silicones

Polyether

Polysulfides



STIFFNESS

Polysulfides

Condensation silicones

Addition silicones

Polyether

TEAR STRNGTH

Addition silicones

Condensation silicones

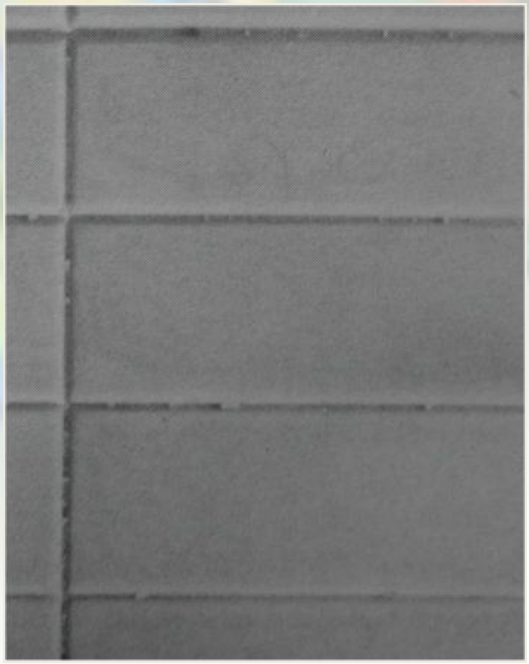
Polyether

Polysulfide

Detail Reproduction:

All reproduce 0.02mm wide line except the very high viscosity 0.075mm line.

- Compatible with gypsum.



Properties

Setting time

Polysulphide: longest S.T 7-10 min.

↓ Condensation silicone 6-8 min.

↓ Addition silicone 6-8 min.

↓ Polyethers 3-4.5 min.

Factors affecting working-setting time

Temperature

Humidity

Viscosity

Working and setting time


Thank
You