4. Zinc oxide eugenol (ZOE) impression paste:

It's described as a rigid, mucostatic impression material, Hydrophobic, irreversible impression material which set by chemical reaction. The combination of zinc oxide and eugenol is widely used in dentistry.

General uses of zinc oxide –eugenol

1. Final impression for edentulous arches.
2. Occlusal bite registration.
3. Temporary filling.
4. Surgical pack in periodontal surgical procedure.
5. Root canal filling.
6. Cementation and insulating medium.

Types of Zinc oxide eugenol impression material

1. Type I hard.
2. Type II soft.

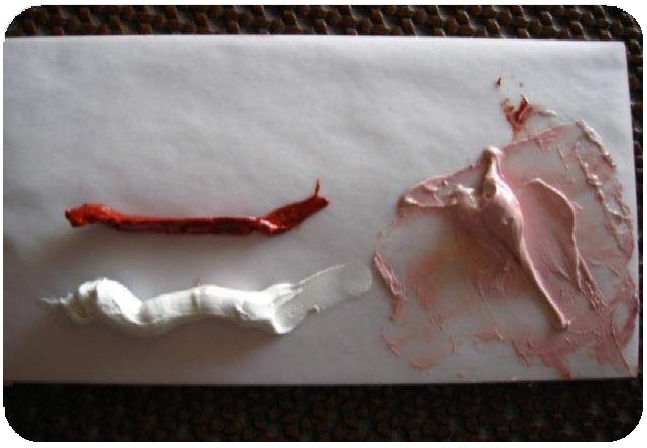
The difference between two types related to their hardness after setting.

Dispensing

Usually supplied as two pastes in collapsible metal tubes.

- Base paste (white color).
- Reactor or accelerator or catalyst paste (red in color).





Composition

	Component	Function
Base paste	Zinc oxide 87%	Reactive component.
	Vegetable and mineral oil 13%.	Act as a plasticizer (smoother mix) and retard the rate of reaction to increase the setting time
	Water.	Initiator.
Accelerator paste	Eugenol (oil of cloves) 12%	Reactive component.
	Accelerators CaCl2	Accelerate the setting reaction.
	Filler (silica type) 20%.	Increase the strength and form a paste.
	Gum or polymerized rosin 50%.	Speed the reaction and produce smoother mix.
	Resinous balsam 10%.	Improves flow and mixing properties.
	Coloring agent 5%. Water.	

Chemical reaction

Zinc oxide +eugenol $\xrightarrow{H_2O}$ Zinc eugenolate +zinc oxide (unreacted)

The set material consists of a mixture of amorphous zinc eugenolate matrix which holds unreacted zinc oxide particles together.



Manipulation

The proper proportion of two pastes is generally obtained by squeezing two ropes of pastes of the same length onto the mixing slab (glass slab or oil impervious paper pad mixed). A flexible stainless-steel spatula is used for mixing. The reactor paste is first collected and applied over the base paste. It is now mixed with broad strokes in a sweeping motion until a uniform homogeneous color mix is obtained. Mixing time is approximately 1 minute.

the mix is collected and spread over the special tray and is placed in the mouth. The surface of the special tray should be dry since the material will not adhere to wet surfaces. The mix will stick to the dried skin and instruments. So it is advisable to coat the patient's lips with petroleum jelly. This enables excess impression paste to be wiped away.

It is held firmly in position (in the patient mouth) until the material has uniformly hardened. Once the material has set, the impression is removed from the mouth. If the impression is not properly recorded another increment of a fresh mix can be placed over that and better impression can be obtained.

Cast is made by pouring a mix of dental stone and water into the impression and allowing it to harden. No separating medium is required when making the cast. The impression can be separated from the cast by immersing in hot water at 60°C for 5–6 min.

Properties

1. These materials are nontoxic but those containing eugenol can be irritant giving stinging or burning sensation to the patient and leaving a persistent taste, which some patients may regard as unpleasant. So non eugenol paste was developed where the zinc oxide is reacted with a carboxylic acid.
2. Relatively low viscosity (mucostatic) allows all the finer details to be recorded in the impression.
3. Rigid inelastic once set and should not be used for partially edentulous arches, or undercut areas it's fractured when removed from undercut area.
4. It requires a fit special tray (without space) for impression making.
5. It has adequate adhesion to acrylic tray (no need adhesive material).

6.It has advantages of being dimensionally stable, a negligible shrinkage (less than 0. 1 %) may occur during hardening.

7.It does not stick to the cast material (No separating medium is needed before the stone model is poured).

8.The paste tends to adhere to skin, so the skin around the lips and the cheek should be protected with petroleum jelly (Vaseline) to make the cleaning process much easier.

9.It can be checked in mouth repeatedly without deformation.

10.Setting time should not be too long as it causes inconvenience to the patient and should not be too short so that the material cannot be manipulated.

- Type I: Initial setting time = (3-6) Min., final setting time = 10 Min.
- Type II: Initial setting time = (3-6) Min., final setting time = 15 Min.

Factors affecting setting time		
Factors	*To decrease setting time*	*To increase setting time*
Temperature	Increase (Glass slab and spatula can be heated)	Decrease (Glass slab and spatula can be cooled)
Humidity	*Increase*	*Decrease*
Altering the ZnO paste to eugenol (not recommended)	More eugenol paste (reactor)	More ZnO paste (Base)
Mixing time (within limits)	Faster and longer	Slower and shorter
Chemical Modifiers	Add accelerators (CaCl2, MgCl2, and water)	Add retarders (inert oils and waxes

Advantages	Disadvantages
High surface details	Rigid and cannot be used in undercut ridge
Dimensionally stable	Irritating to soft tissue
Inexpensive	Variable setting time due to temperature and humidity
No need for separating medium	Need special tray
Easy of manipulation	Patient's lips and cheek should be vazalined.
	Messiness and instrument are difficult to clean.