# Impression for crown and bridge work

## Lecture 8


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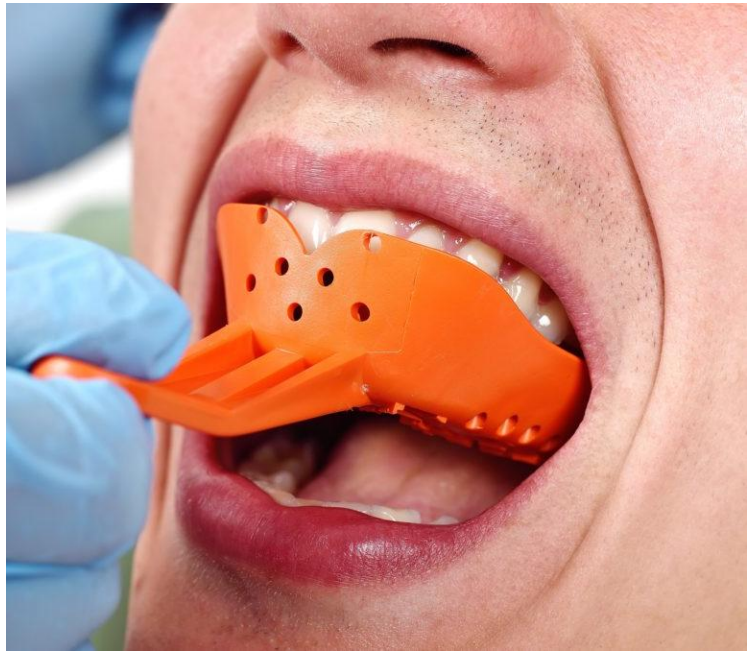
**Third stage**

**Definition:** an impression is a negative reproduction of an object, from which, a positive reproduction (or cast) could be obtained.







## The objective of taking an impression

- Because it is neither possible nor desirable to make patterns for fixed prostheses directly in the mouth, an impression of the teeth and surrounding structures is necessary to obtain a cast.
- This cast is then used to make restoration in the laboratory. To obtain the cast, elastic impression material is placed in a tray that is inserted into the patient's mouth.
- When the material has been set, it is removed from the patient's mouth. A suitable dental stone is then poured into the "negative" impression, and a positive likeness or working cast is obtained.

## Requirements of an acceptable impression

**1.** An acceptable impression must be an exact record of all aspects of the prepared tooth. This means that it must include sufficient unprepared tooth structure immediately adjacent to the margins so that the restoration could be fabricated with proper contour by the laboratory technician.

**2.** All teeth in the dental arch and the soft tissues immediately surrounding the prepared tooth must be reproduced in the impression. This will allow the cast to be accurately articulated and contribute to the proper contouring of the planned restoration.

**3.** The impression must be free of air bubbles, tears, thin spots, and other imperfections that might induce inaccuracy.

# Requirements of an impression material

***1.*** It should be *elastic* after its placement in the patient's mouth so that it can be removed from the undercut areas that exist on the external tooth surfaces adjacent to the prepared tooth without distortion or fracture.

***2.*** It should have adequate *strength* to resist breakage or tear on removal from the patient's mouth *(adequate tear strength).*

***3.*** It should have adequate *dimensional stability* over temperature and humidity ranges normally found in clinical or laboratory procedures for a period long enough to permit the production of a cast or die.

***4.*** It should have adequate *accuracy* for the production of the fine details so that it is an exact negative reproduction of the prepared and unprepared teeth.

***5.*** It should be *easy to use with a minimum of equipment.*

***6.*** It should be *free of toxic or irritating components.*

# Classification of impression materials

## 1. Non-elastic impression materials:

a. Impression compound.

b. Impression plaster.

c. Zinc-oxide eugenol paste.

These materials are not used routinely in crown and bridge work because when they are set they become rigid so upon removal from the undercut areas they will fracture.

## 2. Elastic impression materials:

a. Hydrocolloids (water-based systems):

-Reversible hydrocolloids (agar impression material).

-Irreversible hydrocolloids (alginate impression material).

b. Elastomers:

-Polysulfide impression material.

-Condensation silicone impression material.

-Polyether impression material.

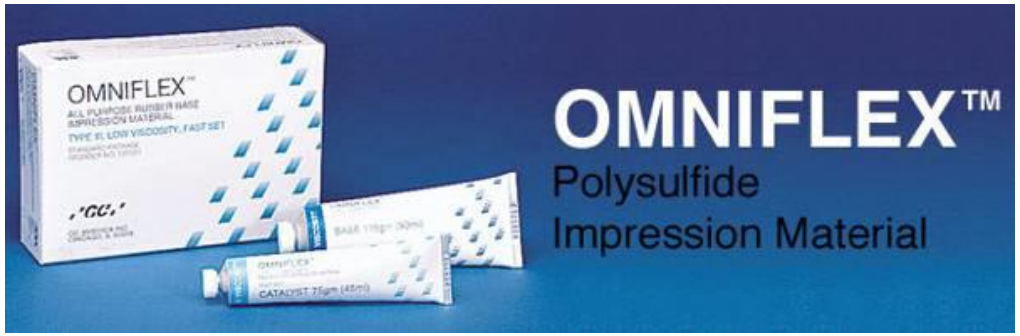
-Addition silicone impression material.

# 1- Polysulfide impression material

- The Polysulfides, commonly known as "rubber bases", and used widely by dentists because of their better Dimensional stability and tear strength than hydrocolloids.
- Nevertheless, the polysulfide impression needed to be **poured as soon as possible** after Impression taking since the delay of over an hour resulted in clinically significant dimensional change.



- **Chemical composition of polysulfide impression material**
- The material is supplied as a two-paste system (***base* and *catalyst***) in three consistencies (**heavy, medium, and light bodies**) which differ only in the amount of filler loading.
- **The base** is composed of polysulfide polymer, titanium dioxide, zinc sulfate, copper carbonate, or silica.
- **The catalyst** is composed of lead dioxide, dibutyl or dioctyl phthalate, sulfur, and other ingredients such as magnesium stearate and deodorants.
- **Water is a by-product** of polysulfide polymerization.
- Its evaporation results in a slight contraction of the polymerized material, which can be minimized through the use of a special tray as this reduces the material's thickness.



**Advantages of polysulfide impression material:**

1. It has high tear resistance and elastic properties, facilitating impression-making sulcular areas and pinholes.

2. It has improved dimensional stability over hydrocolloids but is inferior to polyether and additional silicone.

3. It is the least expensive of elastomers.

**Disadvantages of polysulfide impression material**

1. It has dimensional instability which is due to the mode of polymerization of polysulfide which is of condensation type which gives off the water as a by-product, whose evaporation from the set material causes dimensional contraction.

2. It has a long setting time in the mouth (typically 10 minutes), which induces poor patient acceptance (especially due to its unpleasant sulfide odour).

3. Humidity and temperature dramatically reduce its working time which may be so short that polymerization begins before insertion in the mouth with resultant severe distortion.

4. Most polysulfide materials are polymerized with the aid of lead peroxide (catalyst) which gives the material its typical brown colour the polymerized material is so sticky and should be handled carefully since it could stain the clothes permanently.

## 2- Condensation silicone impression material

- Condensation silicone has been developed to overcome some of the disadvantages of polysulfide. It is odourless and can be pigmented to virtually any shade.
- An additional advantage of condensation silicone over polysulfide is its relatively short setting time in the mouth (typically 6-8 minutes).
- It is also less affected by high operatory temperatures and humidity.
- Unfortunately, its dimensional stability is less than that of polysulfide although greater than that of reversible hydrocolloids.

## Chemical composition of condensation silicone impression material

- The material is supplied as a *base* and an *accelerator* in a low consistency and putty-like consistency.
- The base is composed of a linear silicone called *polydimethylsiloxane* and fillers (either calcium carbonate or silica).
- The **accelerator** may be a liquid that consists of stannous octoate suspension and alkyl silicate, or it may be supplied as a paste by adding a thickening agent.






## Disadvantages of condensation silicone impression material

1. The main disadvantage of condensation silicone is its poor wetting characteristics because it is extremely hydrophobic; therefore, the prepared teeth and gingival sulci must be completely moisture-free for a defect-free impression.

2. It has dimensional instability due to the mode of polymerization, which is of condensation type and gives off **ethyl alcohol as a by-product**, whose evaporation from the set material causes dimensional contraction.

3. Pouring the condensation silicone impression without trapping air bubbles is more difficult than with other impression materials.

# 3- Polyether impression material

- Polyether impression material has a polymerization mechanism unlike those of the other elastomers. **No volatile by-product** is formed, and thus it has excellent dimensional stability.

**Chemical composition of polyether impression material**

- The material is also supplied as a two-paste system (*base* and *accelerator* or *catalyst*) in three consistencies (low, medium, and heavy bodies).
- The base paste consists of a long-chain polyether copolymer, silica fillers, compatible plasticizers of a non-phthalate type, and triglycerides. The catalyst paste consists of an aliphatic cationic initiator, silica fillers, and plasticizers.

## Advantages of polyether impression material

1. It has high dimensional stability since no volatile by-product is formed and its polymerization shrinkage is unusually low compared with most room-temperature cured polymer systems. Therefore, an impression made of polyether can be poured more than a day after the impression has been made and still have accurate casts. The new polyether materials can be poured up to 14 days after impression taking.

2. It has a short setting time in the mouth (typically 5 minutes, or less than half the time required for polysulfide).

## Disadvantages of polyether impression material

1. The set material is stiff. This causes problems when separating a stone cast from the impression, especially in thin and single teeth as in the mandibular incisors.

However, this problem has been recently solved with the introduction of soft polyether materials such as Impregum Penta Soft.

2. The polyether is stable only if stored dry; since it will absorb moisture (imbbition) and significantly change dimensionally.

3. The allergic hypersensitivity to polyether manifested as a sudden onset of burning, itching, and general oral discomfort.

# 4- Addition silicone impression material (polyvinylsiloxane)(PVS)

- The main difference between the addition of silicone and the condensation silicone is that it has much greater dimensional stability than the condensation type as its polymerization reaction does not give off any by-product.

## Chemical composition of additional silicone impression material

- The material is also supplied as a two-paste system (*base* and *accelerator* or *catalyst*) in extra low, low, medium, heavy, and very heavy (putty) consistencies.
- **The base paste** consists of dimethylsiloxane with vinyl terminal groups, plus fillers.
- **The accelerator (catalyst)** also contains dimethylsiloxane with vinyl terminal groups, fillers, and platinum catalysts.

## Advantages of additional silicone impression material

1. It has high dimensional stability which is equivalent to polyether.

2. The set material is less rigid than polyether.

## Disadvantages of additional silicone impression material

1. The adverse tissue responses have been reported.

2. Setting inhibition by some brands of latex gloves.



# Final impression

- To take a final impression, we need a special tray (custom tray), impression syringe, and impression material.
- The special tray is constructed on the study cast.





# Advantages of the study cast

1. It is useful for diagnosis and treatment planning.

2. It is used for the construction of a provisional restoration.

3. It is used for the construction of a special tray.







## Advantages of the special tray

1. It allows the use of the impression material in minimum thickness, so it reduces its dimensional changes.
2. It reduces the discomfort of the patient because it is well-fitted to the patient's mouth.
3. Its small size prevents the forcible opening of the mouth.

## Materials used to construct the special tray

1. Auto-polymerizing acrylic resin (mostly used).
2. Shellac base plate.
3. Vacuum thermoplastic material.

## Construction of the special tray

1. With a pencil, we draw a line on the study cast around the dental arch about **5 mm cervical to the gingival margin**. This line represents the finishing line of our special tray.

2. **We apply two layers of base plate wax on the study cast.** Then we remove the wax from the periphery until we see the line we have drawn (cut back).

3. After that, **we create two perforations in the occlusal surface of the wax** (2 posterior and 1 anterior) to obtain stoppers for our special tray. The stoppers are created in the area of non-functional cusps.

**The stoppers serve the following advantages:**

-They help to equalise the pressure that is going to be applied to the tray.

-They help to localise the tray in the patient's mouth during impression taking.

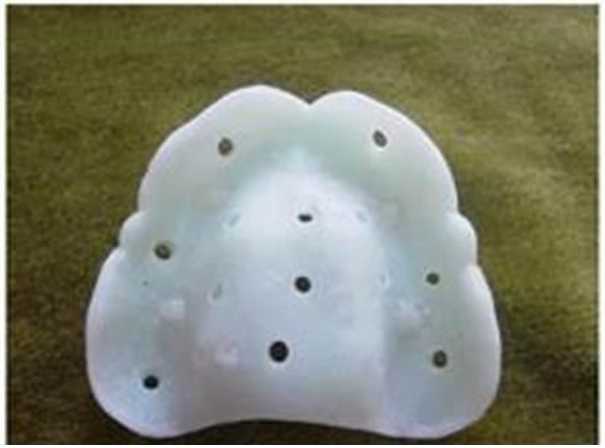
-They maintain an even space for the impression material.

-They prevent the sinking of the impression tray.




## Custom Tray With Spacer





4. A layer of tin foil is adapted to the two layers of the wax.

5. **Auto-polymerizing acrylic resin** is mixed according to the manufacturer's instructions.

- When it reaches the dough stage, it is adapted to the wax that has been covered with tin foil.
- The excess acrylic resin beyond the line previously drawn is removed. The excess acrylic resin removed can be used to construct a handle for the special tray.
- After the complete polymerization of the acrylic resin, the tray is removed from the cast. Removal is facilitated by the presence of tinfoil which will prevent the acrylic resin from sticking to the wax. Then the margins of the special tray can be finished, smoothed, and polished.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