

# Waxes

*Prof. Dr.*

*Mohammed AL-Khafagy*

Waxes are **thermoplastic** materials which are normally solids at room temperature but melt to form mobile liquids when heated.

They are soft substances with **poor mechanical** properties and their primary use in dentistry is to form **patterns** of appliances before casting.

**Natural waxes** are distributed in nature  
(**plant wax & insect wax**)

whereas **synthetic waxes** are produced  
by combination of various chemicals in  
the laboratory or by **chemical action** on  
natural waxes.

The additives may be natural materials  
and synthetic products.

**Dental waxes** may be composed of natural and synthetic waxes, gums, fats, fatty acids, oils, natural and synthetic resins, and pigments of various types.



- There are many varieties of waxes used, both in the clinic and laboratory.
- Each have particular properties depending on what it is used for.
- Their basic constituents are essentially similar; their exact proportion is different.

# Requirements of dental waxes:

1. Must produce to the exact size and shape and contour of the appliance which is to be made.
2. Should have enough flow when melted to reproduce the fine details.
3. No dimensional change should takes place once it's formed.
4. Boiling out of the wax without any residue.
5. Easily carved and smooth surface can be produce.
6. Definite contrast in color to facilitate proper finishing of the margins.

# Characteristic Properties of Waxes

**Melting Range**, because waxes may contain **several types of molecules**, each having a range of molecular weight, they have melting ranges **rather than** melting points.

**Softening point**, For **many applications** of waxes the **softening temperature** should be just **above mouth** temperature.

This is in order that the material may be introduced into the mouth in a mouldable state but will become relatively rigid at mouth temperature.

**Coefficient of thermal expansion,** waxes **expand** when subjected to a **rise** in temperature and **contract** as the temperature is **decreased**.

This expansion and contraction may be **reduced** by the **blending** of different types of waxes.

**Thermal conductor,** waxes are **very poor** thermal conductors.

# **Toughness and brittleness:**

**Toughness** is required for some waxes as **casting wax** that may require **removal from the cast many times** that may have slight undercuts.

While **brittleness** is required for waxes as **inlay wax** where it should **fracture** when removed from **deep undercuts** rather than **distort**.

## **Flow:**

This property results from the **slippage** of molecules over each other.

It greatly affects the **ability** of the wax to record **details** at moulding temperature.

The wax should ideally **exhibit considerable flow** at the **moulding temperature** but show **little or no flow** at **mould temperature** or **room temperature** so that they are not easily distorted.

# Residual stress:

During **cooling** of the wax, **solidification** of the **surface layers** of the wax occur well **before** the **bulk becomes rigid**, this **produces significant internal stresses**.

Dimensional changes may occur due to relief of the stresses.

**Greater stresses** may be incorporated in the wax if not **properly softened before moulding**.

# Ductility,

like flow, ductility increases as the temperature of a wax is increased.

In general, waxes with lower melting temperatures have a greater ductility than those with higher melting temperatures.

# Warpage:

Pattern wax has a **high coefficient of expansion** and tends to warp or **distort** when allowed to stand **unrestrained**.

The **distortion** is **increased** as the **temperature** and **time of storage** are **increased**.

This is related to the **release of residual stress developed** in the pattern during the process of formation.

# Warpage:

This is because the residual stress in the pattern is associated with the forces necessary to shape the wax originally.

This characteristic of stress release and warpage is present in all dental waxes, but is particularly **troublesome in inlay patterns** because of the critical dimensional relations that must be maintained in inlay castings.

# The incorporation of residual stress can be minimized by:

(1) softening a wax uniformly by heating at 50C for at least 15 minutes before use.

(2) by using warmed carving instruments and a warmed die.

(3) by adding wax to the die in small amounts.

# Classification of waxes

Historically waxes have been classified according to their origin:

- (1) mineral
- (2) plant
- (3) insect

# 1- Mineral waxes:

A distillation products of petroleum.

*a. Paraffin* (melts 40-70°C) tends to be brittle.

*b. Ceresin or Microcrystalline* (60 - 90°C) is more flexible and tougher.



## 2- Plants waxes:

- a. *Carnauba* occurs as fine powder on the leaves of certain tropical plants.
  - Melting range: 84 - 91°C.
  - It is raise melting range and hardness of paraffin.
- a. *Candelilla* (68 to 75°C).  
Mainly hardens paraffin wax.



### 3- Animal waxes:

- *Glyceride wax*: obtained from beef fat, can be used to increase melting range and hardness of waxes.



## 4- Insect waxes:

- *Bees wax*: obtained from honeycomb, melting range (63-73°C), its brittle at room temperature, plastic at body temperature.



## 5- Synthetic wax:

- They are used to modify some properties of natural waxes like polyethylene.



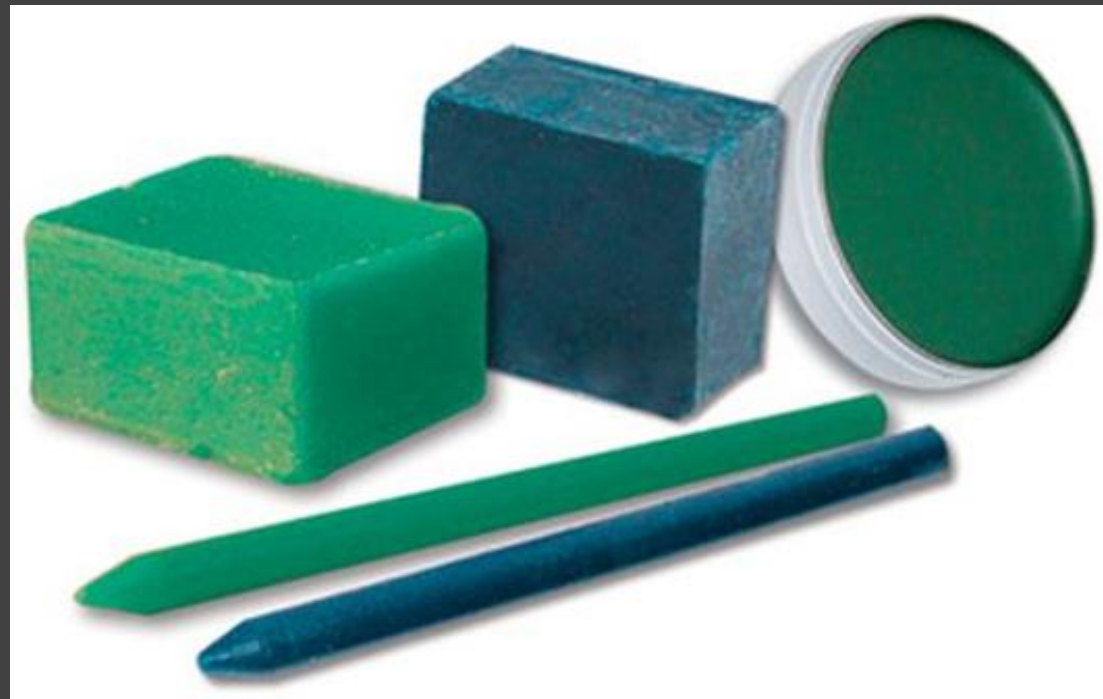
# According to their use and application in dentistry

<b>Pattern wax</b>	<b>Processing wax</b>	<b>Impression waxes</b>
<b>Inlay</b>	<b>Boxing</b>	<b>Impression Corrective</b>
<b>Denture Casting <i>Sheet</i> <i>Ready Shapes</i></b>	<b>Beading</b>	<b>Bite registration</b>
<b>Bite rim wax and Modelling wax</b>	<b>Sticky</b>	

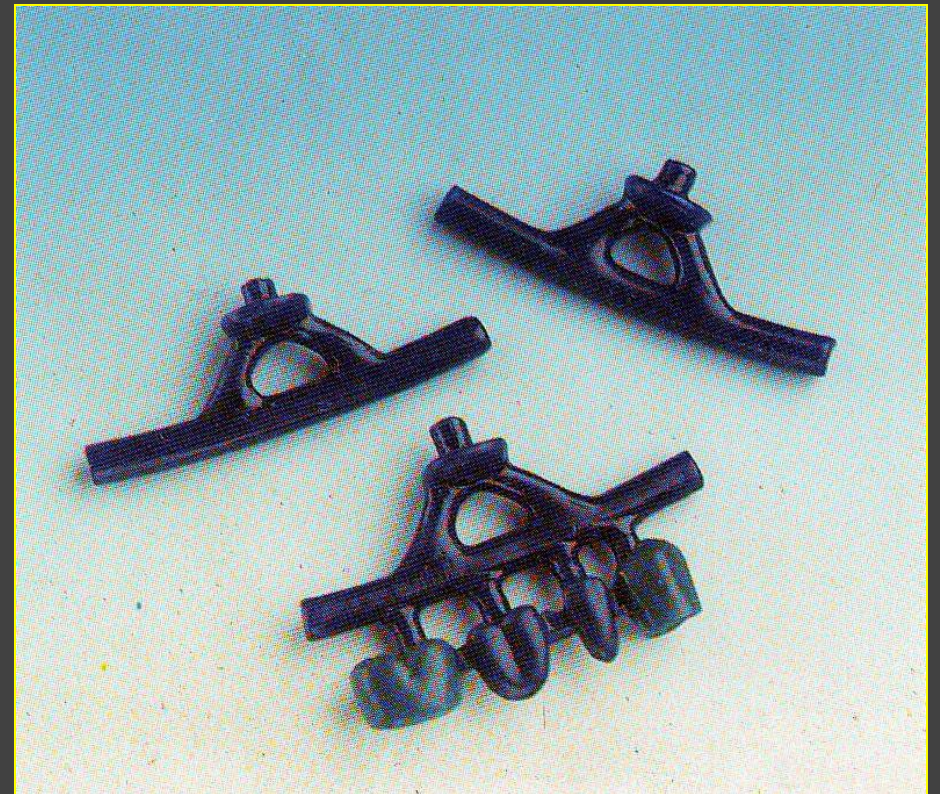
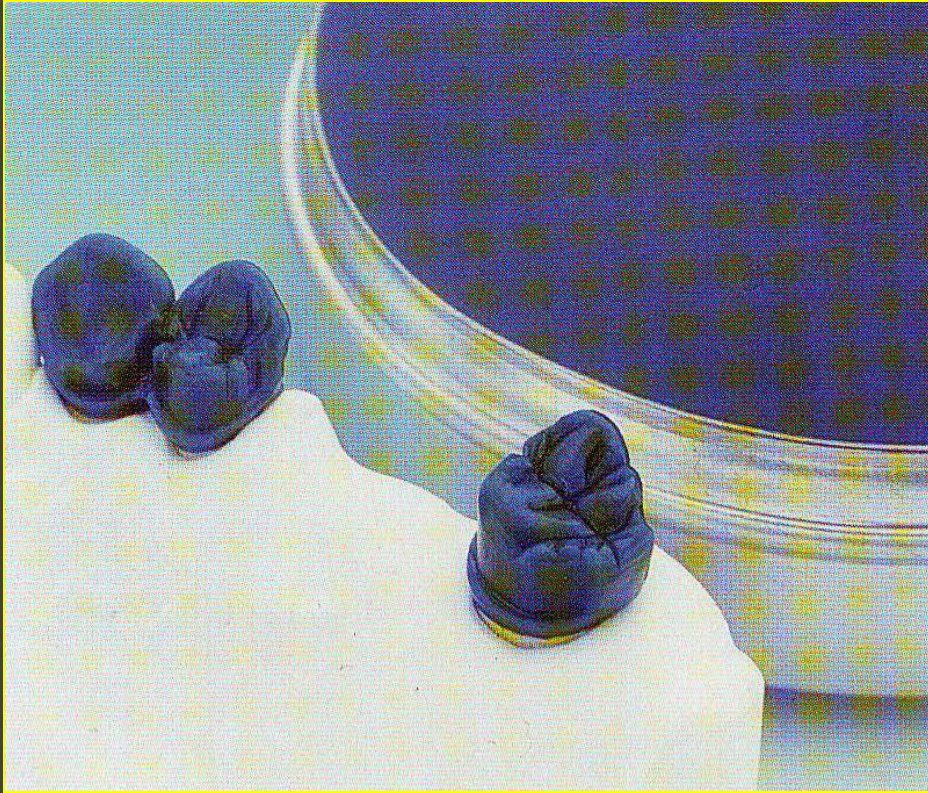
## A) Pattern waxes:

### 1) Inlay wax:

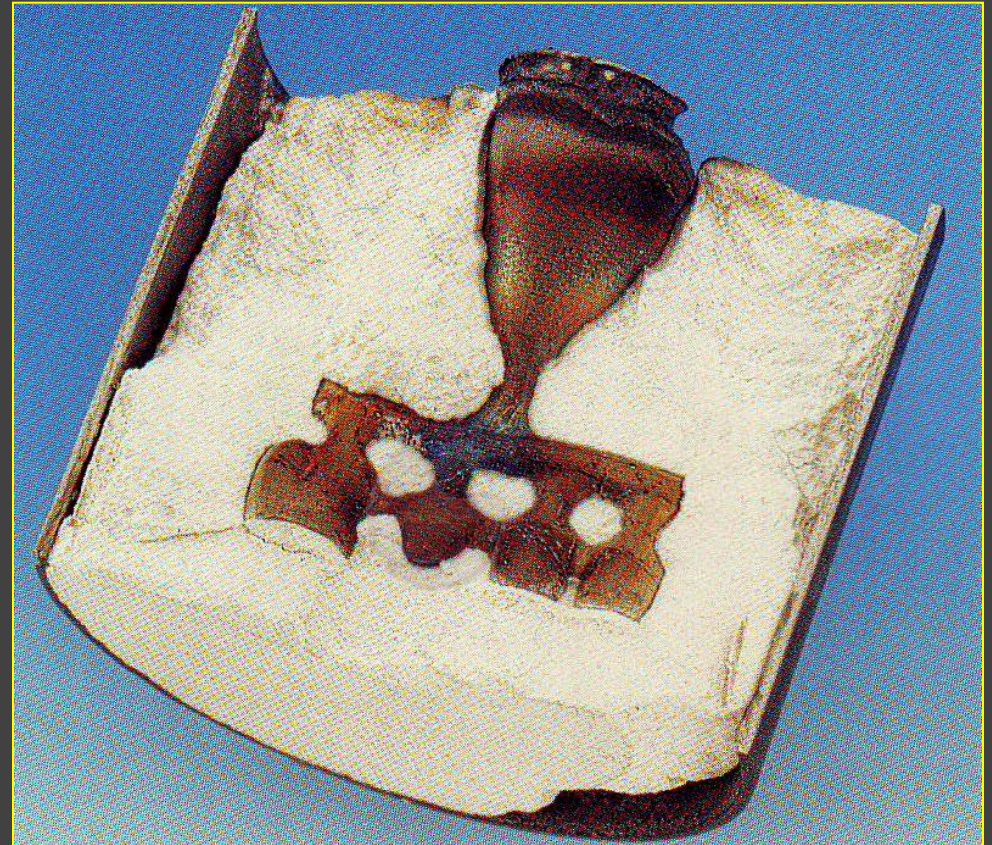
Gold inlays, crowns ,and bridge units are formed by a casting process that uses the *lost-wax pattern technique*.



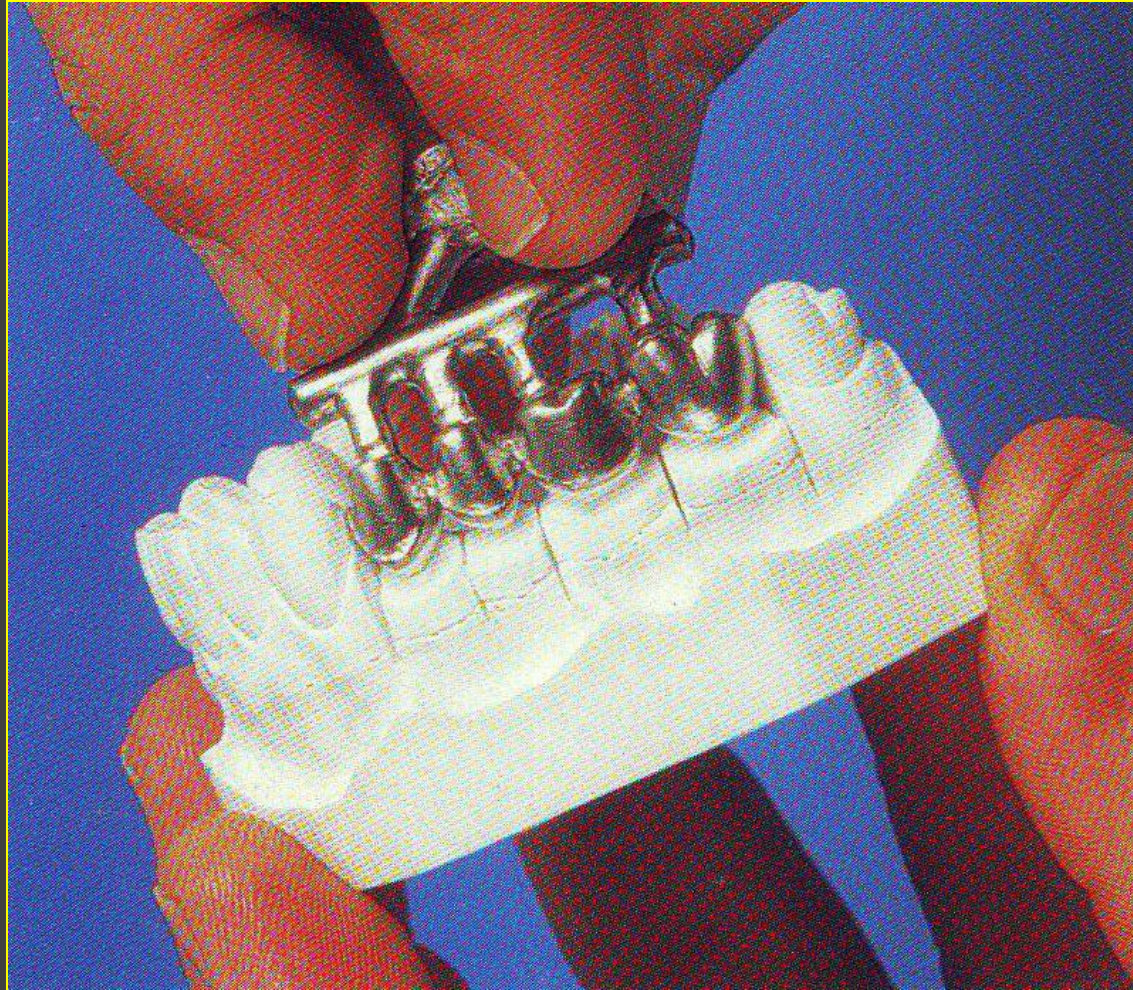
# *lost-wax pattern technique.*



# *lost-wax pattern technique.*



# *lost-wax pattern technique.*



## A) Pattern waxes:

### 1) Inlay wax:

Composition: The principal waxes uses to formulate inlay waxes are

- paraffin
- microcrystalline wax ,
- carnauba,
- candelilla,
- Bees wax.



## A) Pattern waxes:

### 1) Inlay wax:

#### Types:

Type1(soft): Wax is soft used as an indirect technique wax.

Type2(hard):Wax is hard used as direct waxing technique in the mouth ,softening temperature should be above mouth temperature and it should be hard at mouth temperature

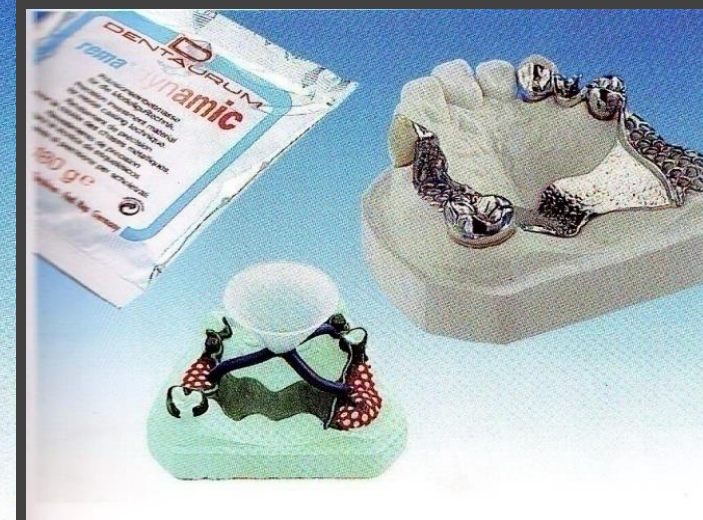
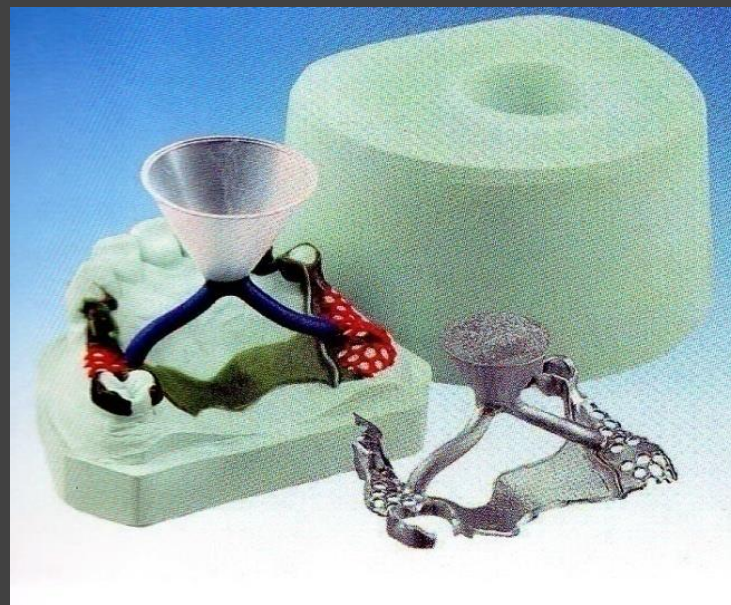
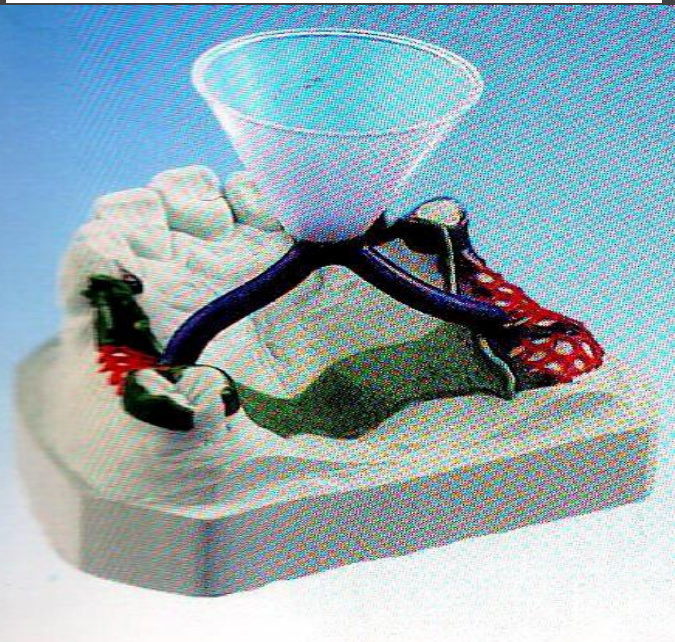
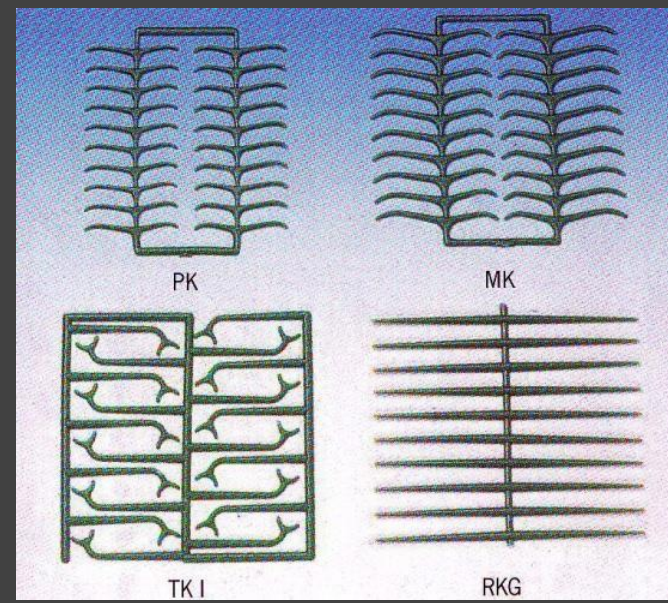
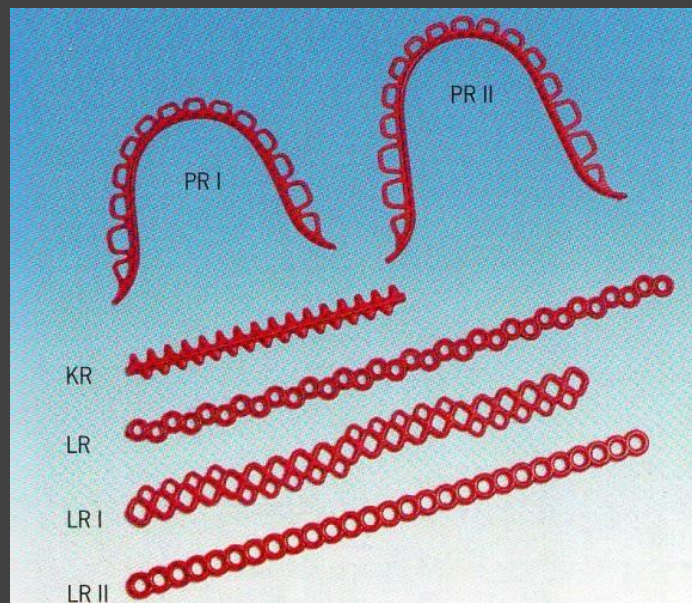
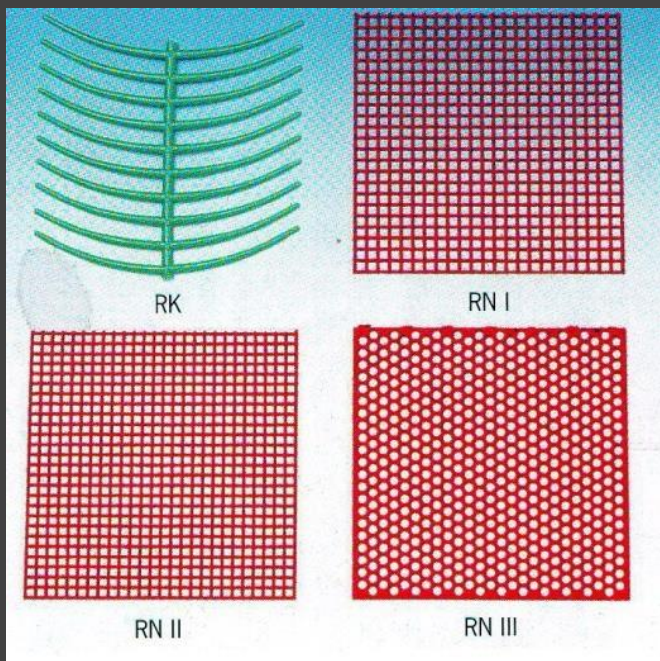


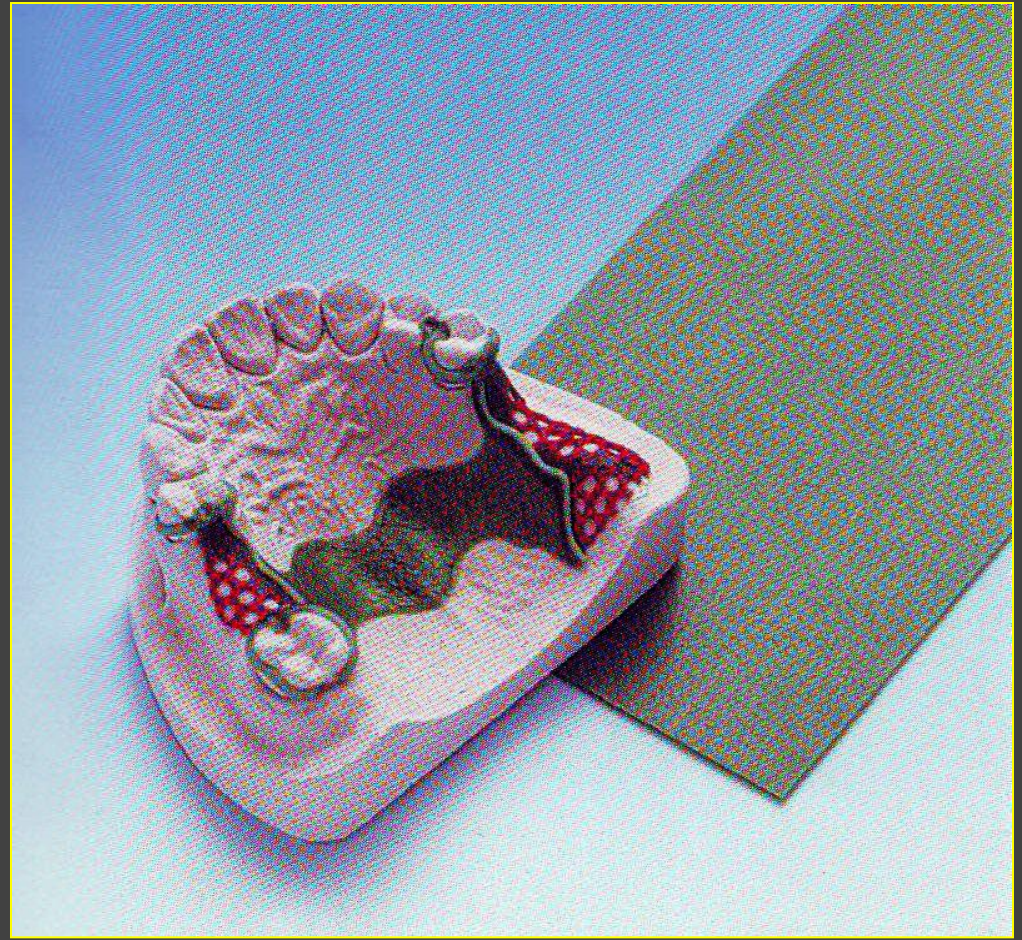
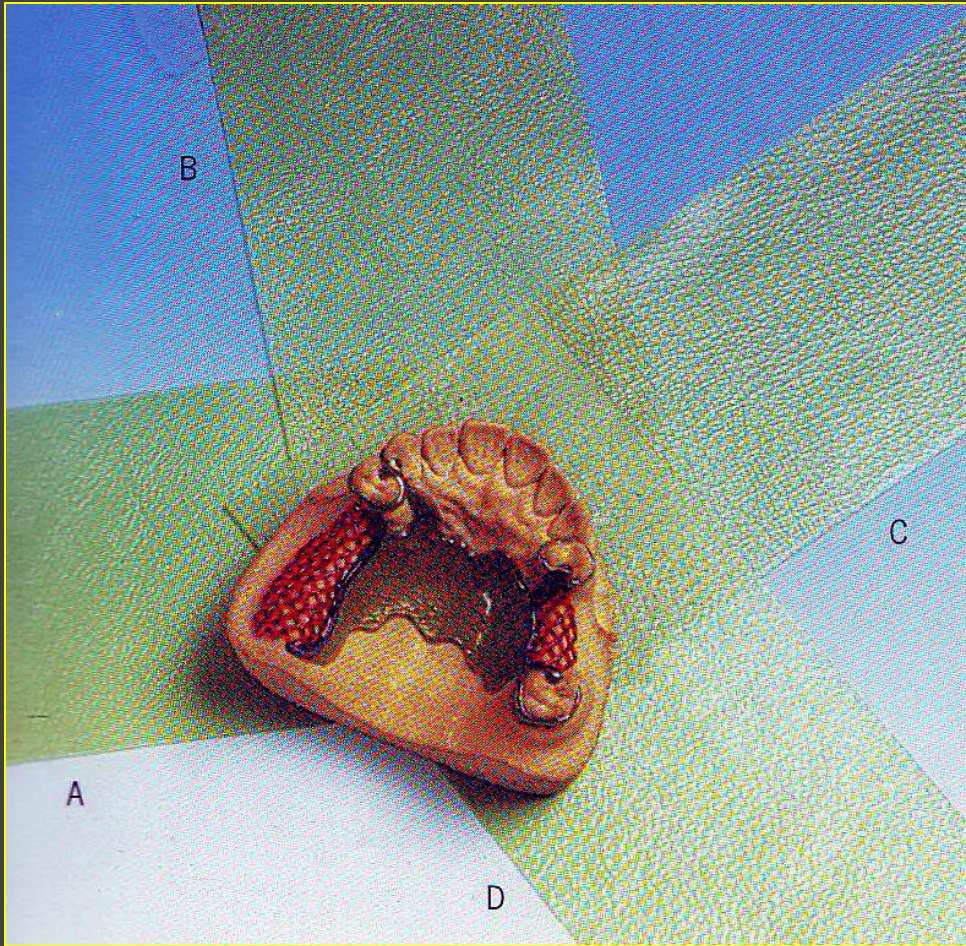
## A) Pattern waxes:

### 2) Denture casting wax :

- The pattern for the metallic framework of removable partial dentures is fabricated from casting waxes.
- These waxes are available in the form of sheets ready-made shapes, and in bulk the ready-made shapes are supplied as round, half round and half-pear-shaped rods and wires of various gauges.







## A) Pattern waxes:



### 3. Bite-rim wax and modeling wax:

It is used to form a wax rim (bite-rim or record base) to :

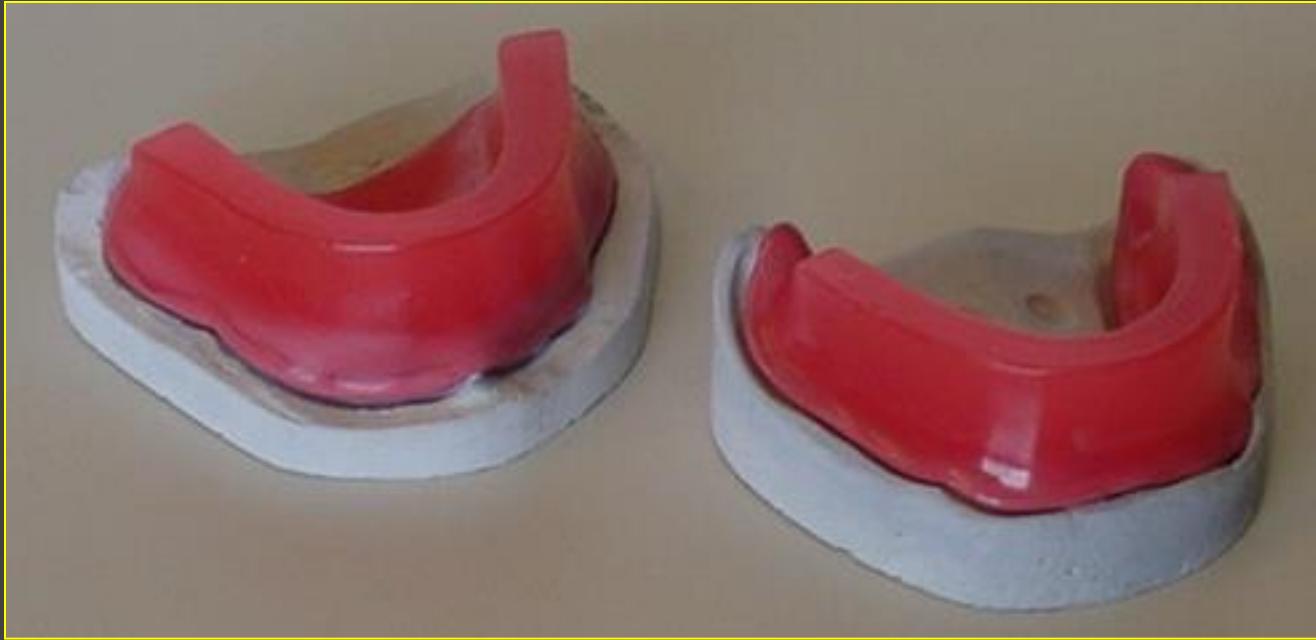
- 1- to establish the vertical dimension,
- 2- to form the initial arch form,
- 3- to record the occlusal relationship,
- 4- to mount the artificial teeth on the bite rim.
- 5- to produce the desired contour of the denture after the teeth are set in position in complete denture construction.

## A) Pattern waxes:

### 3. Bite-rim wax and modeling wax:

- These waxes should have a softening temperature above mouth temperature so that they are not distorted when placed in mouth.
- They are tough to resist fracture when withdrawn from shallow undercuts.
- They could be eliminated from the mould by melting in boiling water leaving no residue





*Dr. Mohammed T. Al-Khafagy*

## B) Processing waxes:

- 1) **Boxing wax:** it is used to form a plaster or stone cast from an impression of the edentulous arch,
  - It should have sufficient strength and toughness for convenient manipulation.



## B) Processing waxes:

2) **Beading wax:** it is a long, narrow stick or strip of wax adapted around the impression below its peripheral height, producing a form around the entire impression, then the boxing wax is attached to it.

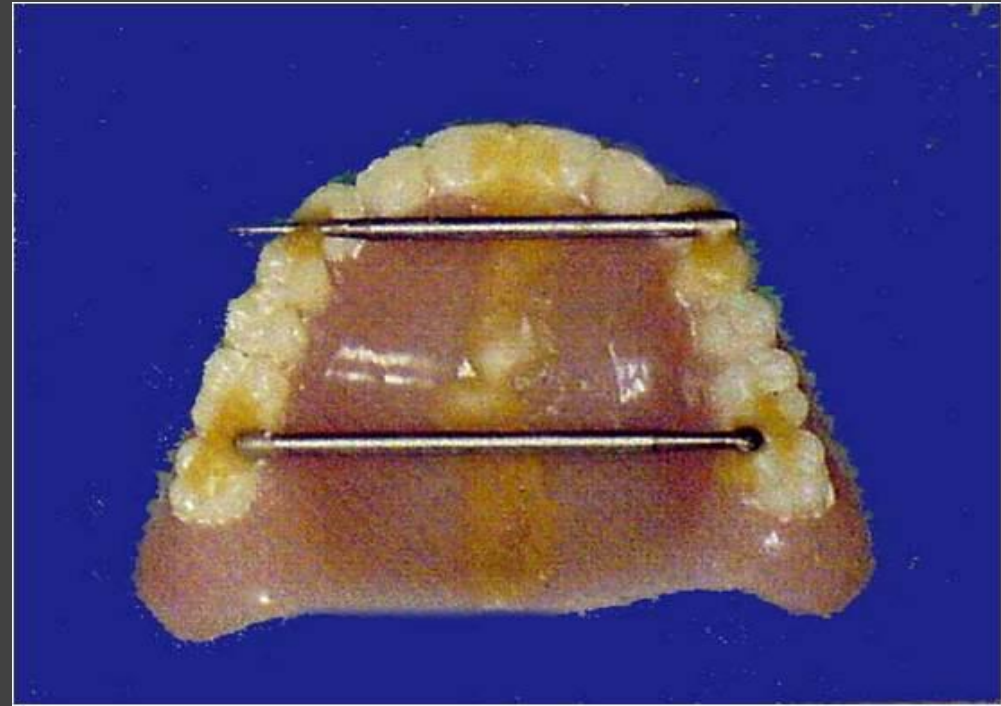




## **B) Processing waxes:**

3) **Sticky wax:** it is sticky when melted and adheres closely to the surfaces on which it is applied. However, at room temperature the wax is firm, and brittle. The main constituent is beeswax, hence it has the characteristic yellow colour.





## B) Processing waxes:

4) **Undercut block-out wax:** it is used to block the undercut areas of the teeth prior to designing the metal framework of the chrome–cobalt framework.



## C) Impression waxes:

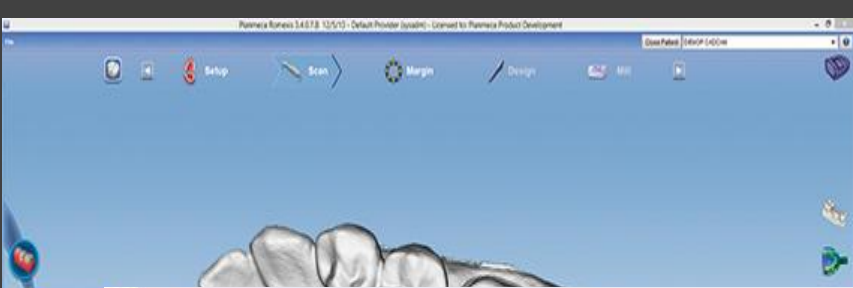
### 1) Corrective impression wax:

Corrective impression wax is used as a wax layer over an original impression to register the detail of the soft tissues.

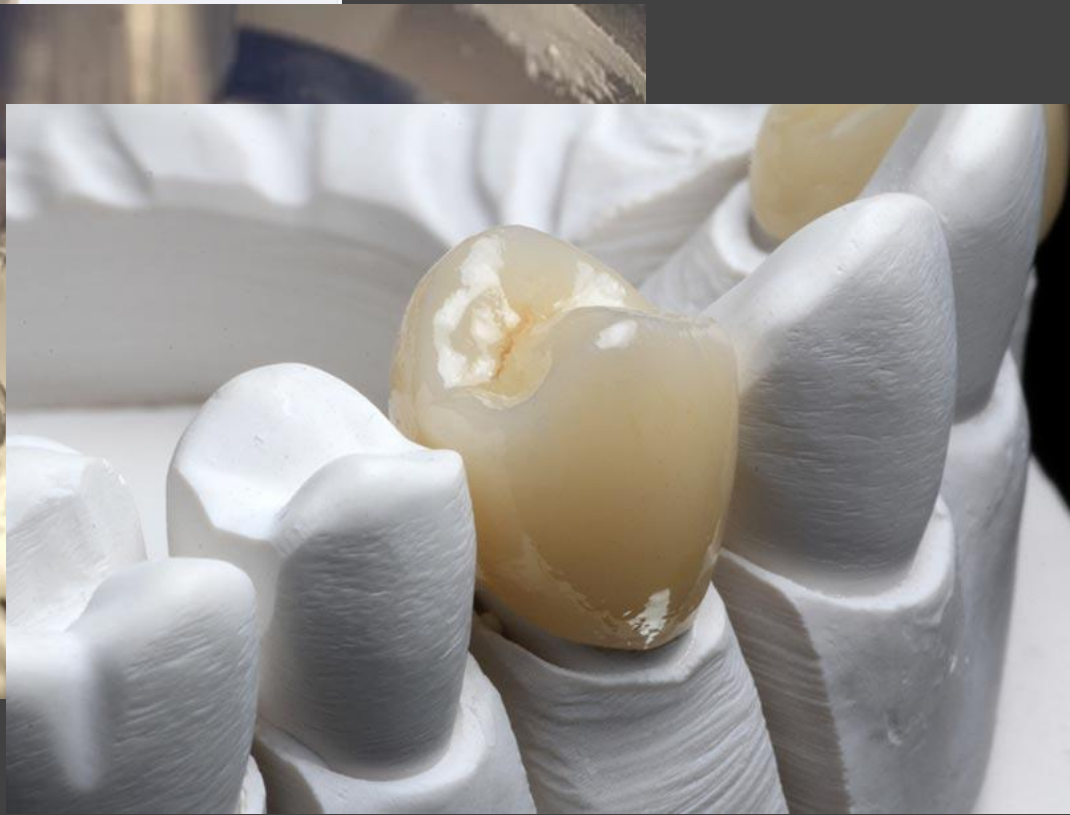
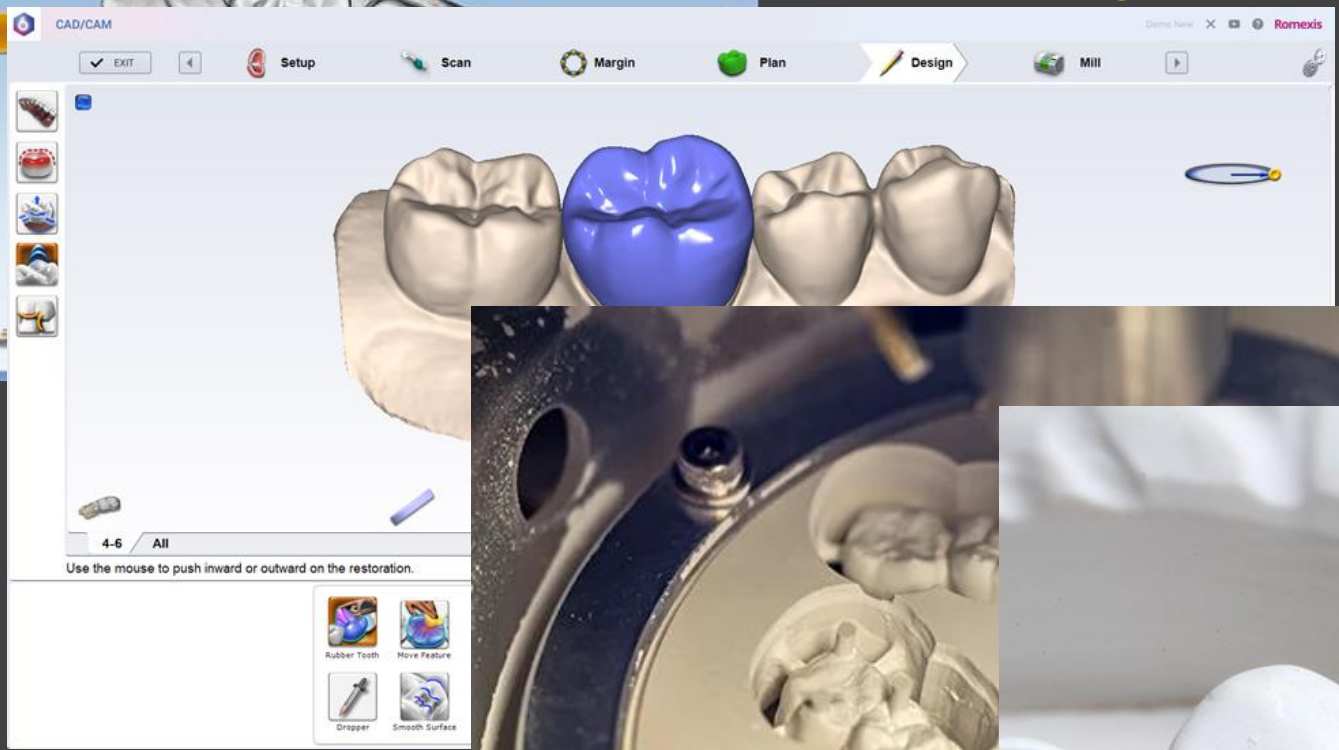
Corrective waxes are formulated from hydrocarbon waxes such as paraffin, ceresin and beeswax and may contain metal particles.

These waxes are subject to distortion during removal from the mouth.





cently.....



Osakay Bence - stock.adobe.com

Any Questions??????

**THANK YOU**