DENTAL WAXES

The primary use of waxes in dentistry is to make a pattern of appliances prior to casting as many dental restorations are made by *lost-wax technique*, in which a pattern is made in wax and put in the mold (investment materials). After setting, the wax is burnt out and the space is filled with molten metal or plastic acrylic. Chemically waxes are polymers consisting of hydrocarbon and their derivatives like ester and alcohol. Dental waxes are mixture of natural and synthetic waxes gums, fat, oils, natural and synthetic resins and coloring agents.

**REQUIREMENTS**

1- Must conform 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 changes should takes place once it is 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.
CLASSIFICATION OF WAXES ACCORDING TO ORIGIN

I- MINERAL

1- Paraffin wax
Refined from crude oil, has relatively low melting point (50-70°C) and relatively brittle.

2- Ceresin wax
Refined from petroleum, has medium melting range (60°C).

II- PLANTS

1- Carnauba
Obtained from palm trees, it is hard, tough, and has high melting point (80-85°C).

2- Candelilla
It is hard, tough, and has high melting point (80-85°C), used to increase the melting point and reduce flow at mouth temperature.

III-ANIMAL

1- Stearin
Obtained from beef fat, has low melting point.

2- Bees wax
Obtained from honey-comb, consist of partially crystalline natural polyester. It is brittle, has medium melting temperature (60-70°C).

IV-SYNTHETIC WAX
They are used to modify some properties of natural waxes like polyethylene.
CLASSIFICATION OF WAXES ACCORDING TO USE

I- PATTERN WAX

1- Inlay wax

It should be hard and brittle in order to fracture rather than to distort when removal from undercut areas.
The wax is blue in color. They are used to make inlays, crowns and pontic replicas. They are mostly paraffin with carnauba wax. There are two types:
   a- Type 1: for direct technique.
   b- Type 2: for indirect technique.

2- Denture casting wax

It is used to produce the metal components of cobalt/chromium partial denture. It is based on paraffin wax with bees wax to give softness necessary for molding and stickiness necessary to ensure adhering to an investment cast material of refractory cast. It is green in color.

3- Denture base plate wax (modeling wax)

It is used to form the base of the denture and in setting of teeth. It is pink in color.
Waxes are used during processing of the appliance:

1- **Beadin wax**
   It is used to make beading around the impression before pouring gypsum to protect the margins of the cast.

2- **Boxing wax**
   It is used to make box around the impression to make pouring gypsum into the impression easier and more perfect.

3- **Block out wax**
   It is used to block out undercut areas on cast during processing of co/cr metal framework.
4- **White wax**

It is used to make pattern simulate veneer facing in crowns.

5- **Sticky wax**

It is used to join and stabilize temporary broken pieces of the broken denture before repair.

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**III-IMPRESSION WAX**

They are previously used to make impression, but they distort when removal from undercut areas, they have high flow.

1- **Impression wax**

It is used to make the impression.

2- **Corrective wax**

It is used to record selected areas of soft tissues in edentulous arches.
Properties

1- **They are thermoplastic materials** that are soft when heated and are solid at room temperature.

2- **They have high coefficient of thermal expansion and contraction.** They are the highest of dental materials; it is about $300 \times 10^{-6}$ to $1000 \times 10^{-6}$ cm/cm C. The shrinkage of wax from liquid to solid at room temperature is 0.4 %. Thermal contraction of wax is compensated by expansion of investment.

3- **They are poor thermal conductivity.** After softening of the wax, it is allowed to cool, which accompanied by contraction because of poor thermal conductivity only the outer layer solidify and the inner solidify later which will produce internal stress. Relief of the stresses accrues later especially when temperature increases, greater stresses may be incorporated if the wax is not properly softened. The best way to soften the wax is to be held in the warm raising air above the flame and not in the flame itself.

4- They should have high flow when softened, but should little or no flow at room temperature or mouth temperature in order not to distort.

5- Inlay should be brittle in order to fracture rather than distort when removed from undercut of the cavity.