Dental Waxes

Dental waxes are mixture of natural wax, synthetic wax, & additives like Montan, Gums, Fats, Fatty acids, Oils, Natural and synthetic resins & Coloring agents. Chemically waxes are polymers consisting of hydrocarbon & their derivatives like ester & alcohol.

♦ Indication:

The primary use of waxes in dentistry is to made pattern of appliances prior to casting. As many dental restorations are made by the lost-wax technique, in which pattern is made in wax and put in the mold (investment material); after setting, the wax is burnt out and the space is filled with molten metal or plastic-acrylic.

♦ Requirements:

1. Must conform the exact size, shape & 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 take place once it is formed.
4. Boiling out of the wax without any residue.
5. Easily carved & smooth surface can be produced.
6. Definite contrast in color to facilitate proper finishing of the margins.

♦ Classification of waxes according to origin:

1. Mineral waxes:

Paraffin wax: refined from crude oil, it is relatively brittle, has low melting temperature (40-71Cº).

Ceresin (Microcrystalline) wax: refined from petroleum, it is more flexible & tougher, has medium melting range (60-90Cº).

2. Animal waxes:

Spermaceti is obtained from the sperm whale. It is not widely used. Mainly used as a coating for dental floss.

3. Insect (bees wax):

Derived from the honey comb, consists of partially crystalline natural polyester, it is brittle, has medium melting point (60-70C^{o}).

4. Plant waxes:

Carnauba: it is hard with high melting range (84-91C^{o}).
Candelilla: melting range (68-75C^{o}).

5. Synthetic waxes:

Used to modify some properties of natural wax, e.g. polyethylene.

♦ Classification of waxes according to use:

- **Pattern waxes** (Inlay casting, denture casting & denture base plate).
- **Processing waxes** (beading, boxing, utility, block-out, white & sticky).
- **Impression waxes** (corrective & bite registration).

1.Pattern Waxes: All pattern waxes have two major qualities which cause serious problems in their use; thermal change in dimension & tendency to warp or distort.

A.Inlay Casting Wax:

Uses: for inlays, crowns & bridges.

Classification: Type I: a medium wax employed in direct technique.

Type II: a soft wax used for indirect technique for inlays & crowns.

Supplied as: blue, green or purple sticks. Also available as small pellets & cones.

Composition:

- Paraffin wax 40-60%.
- Ceresin 10%.
- Gum 1%.
- Carnauba wax 25%.
- Candellila wax.
- Synthetic wax.

Properties of Inlay wax:

A. Flow: at 45C both Type I & Type II should have a flow between 70 to 90%.

At 37C Type I should not flow more than 1%. At 30C Type II should not flow more than 1%.

B. Thermal conductivity of these waxes is low. It takes time to heat the wax uniformly & to cool it to body or room temperature.

C. Inlay wax has a high Coefficient of thermal expansion.

D. Wax distortion is the most serious problem; the causes of distortion are due to any method of manipulation that creates inhomogeneity of wax involving the intermolecular distance:

a. If wax is not at uniform temperature when inserted in the cavity.

b. If wax is not held under uniform pressure during cooling.

c. If wax is melted & added in an area of deficiency, the added wax will introduce stresses during cooling.

d. During carving some molecules of wax will be disturbed & stresses will result.

*****To avoid:**

1. Minimal carving & change in temperature.
2. Minimal storage of pattern. Invest immediately.
3. Use warm instrument for carving.
4. Store in a fridge if necessary.

E. This wax is manipulated by direct technique (in mouth) or indirect technique (in laboratory).

F. Polishing is done by ribbing in a silk cloth.

B. Removable Partial Denture (RPD) Casting Wax:

Uses: to make patterns of the metallic framework of RPD.

Supplied as:

Green Sheets: 0.40 & 0.32 mm thickness.

Ready made shape:

a. Round 10cm, half round & half pear shaped rods.

b. Reticular, grid or mesh form.

c. Clasp shapes.

d. Other forms.

Properties: these waxes are tacky & highly ductile as they must adapt easily & stick onto the refractory cast.

C. Base Plate Wax (Modeling wax):

They are classified under pattern waxes because they are used in the construction of dentures & other appliances made of acrylic & like materials.

Uses:

a. To make occlusion rim.
b. To form the desired contour of the denture after teeth are set.
c. To make patterns for orthodontic appliances & other prostheses which are to be constructed of plastics.

Classification:

a. Type I soft for building veneers.
b. Type II medium to use in mouths in normal climates.
c. Type III hard for use in tropical climates.

Supplied as: sheets of pink or red color.

Composition:

- Paraffin or ceresin 80%.
- Bees wax 12%.
- Carnauba 2.5%.
- Natural or synthetic resins 3%.
- Microcrystalline 2.5%.

2. Processing Waxes:

These are used mainly as accessory aids in the construction of variety of restorations & appliances, either clinically or in the laboratory, boxing wax, beading wax, utility wax, block-out wax, white wax & sticky wax.

A.Boxing Wax & Beading Wax:

Uses: beading wax is used to build up vertical walls around the impression before pouring gypsum to protect the margins & boxing wax is used to make a box around the impression to make pouring gypsum into the impression easier and more perfect**.**

Supplied as: boxing wax as sheets, beading wax as strips.

Advantages of beading & boxing:

A. Preserve the extensions & landmarks.
B. Controls the thickness of the borders.
C. Controls the form & thickness of the base of the cast.
D. Conserves the artificial teeth.

Properties: they are pliable & can be adapted easily. A slight tackyness allows it to stick to the impression.

B. Utility Wax:

Composition: it consists mainly of bees wax, petrolatum & other soft waxes in varying proportions.

Supplied as: it is available in the form of sticks & sheets.

Uses: it is used to adjust contour of perforated tray for use with hydrocolloid.

Properties: it is pliable & can be easily molded. It is adhesive & can stick to the tray.

C. Sticky Wax:

Composition: it consists mainly of yellow bees wax, rosin & natural resin such as gum.

Prosperities: it is sticky when melted & adheres closely to the surfaces upon which it is applied. At room temperature, it is firm, free from tackiness & brittle.

Uses: it is used for joining metal parts before soldering & for joining fragments of broken dentures before repair procedure.

D. Block- out Wax: to block- out undercut areas on cast during processing of co/ cr metal framework.

E. White Wax: to make pattern simulate veneer facing in crowns.

3. Impression Waxes:

These are used to record non undercut edentulous portions of the mouth, are generally used in combination with other impression materials such as polysulfide rubber, Zinc oxide eugenol, or dental impression compound, e.g. corrective impression wax & bite registration wax.

A. Corrective Impression Wax:

Uses:

- Make functional impression of free end saddles.
- Record posterior palatal seal in dentures.
- Functional impression for obturators.

Composition & Properties: they consist of paraffin, ceresin & bees wax. It may also contain metal particles. The flow at $37^{o}C$ is 100%. These waxes are subjected to distortion during removal from the mouth. They should be poured immediately.

B. Bite registration Wax:

Uses: it is used to record the relationship between the upper & the lower teeth. This is necessary in order to mount the cast correctly in the articulator.

Supplied as: it is supplied as U- shaped rods on wafers.

Composition: it is composed of bees wax or paraffin or ceresin. Some contain aluminum or copper particles.

General properties of dental waxes:

- They are thermoplastic materials that are soft when heated & are solid at room temperature.
- High coefficient of thermal expansion & contraction. It is the highest of dental materials. Thermal contraction of wax is compensated by expansion of investment.
- Poor thermal conductivity after softening of the wax. It is allowed to cool, which accompanied by contraction because of thermal conductivity only the outer layer solidify & the inner solidify later which will produce internal stress. The best way to soften the wax is to be held in the warm raising air above the flame & not in the flame itself. The ideal way for softening the wax is to use annealer which is thermostatically controlled

oven, keeping the wax just above the softening temperature & ready to use.

- Flow: they should have flow when softened but should little or no flow at room temperature or mouth temperature in order not to distort.
- Brittleness: Inlay should be brittle in order to fracture rather than distort when removed from undercut of the cavity.