Dental Material

Dental Waxes

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Dental Waxes

Introduction

Waxes are thermoplastic materials which are normally solids at room temperature but melt, without decomposition, to form mobile liquids. They are soft substances with poor mechanical properties. There are many varieties of waxes used, both in the clinic and laboratory. Each has particular properties depending on what it is used for. Their basic constituents are similar, their exact proportion is different.

Requirements of dental waxes

1. The wax pattern must conform to the exact size, shape and contour of the appliance to be constructed.
2. No dimensional change should take place in the wax pattern.
3. It should be possible to remove the wax by boiling out or burning without leaving a residue during casting.

Chemical nature of waxes

Dental waxes may be composed of natural and synthetic waxes and additives.

- Natural waxes are distributed in nature whereas synthetic waxes are produced by combination of various chemicals in laboratory.
- The two principal groups of organic compounds contained in waxes are **Hydrocarbons and Esters**

Note: The particular working characteristics of each wax are achieved by blending the appropriate natural and synthetic waxes, resins and other additives.

Composition of waxes

The major components of waxes may be of mineral, animal or vegetable origin.

- **Mineral:** like Paraffin wax and microcrystalline wax are both obtained from petroleum residues following distillation. Paraffin is brittle. Microcrystalline is more flexible and tougher.

- **Animal:** Beeswax, derived from honeycombs, beeswax added to paraffin wax to modify the properties and reduce brittleness.
- **Vegetable:** Carnauba wax and Candelilla wax are derived from trees and plants. They are blended with paraffin wax in order to control the softening temperature and hardens paraffin wax.

  Note: For many applications of waxes the softening temperature should be just above mouth temperature. So that the material can be mouldable become rigid at mouth temperature.

Properties of wax

1. **Melting Range**
   Waxes have melting ranges rather than melting points. Melting range varies depending on its use.

2. **Thermal Expansion**
   Waxes expand when subjected to a rise in temperature and contract as the temperature is decreased.

   Coefficient of thermal expansion
   Dental waxes have the largest CTE among the materials used in restorative dentistry.

3. **Mechanical Properties**
   The elastic modulus, and compressive strength of waxes are low compared to other dental materials. These properties depend on the temperature. As temperature decreases, the properties improve.

4. **Flow**
   The wax should flow readily when melted.
   Flow is dependent on:
   1. Temperature of the wax
   2. Force applied
   3. The length of time the force is applied.

   Flow increases as the melting point of the wax is increased.

5. **Ductility**

   The ductility increases as the temperature of the wax is increased. In general, waxes with low melting points have greater ductility than those with high melting points.

Coloring

Coloring agents, which must be oil-soluble dyes, are also included in waxes, to distinguish between product applications or brand. They have no appreciable effect on physical or mechanical properties.

Types of Dental Waxes

Dental waxes can be classified into one of three types by the application: pattern wax, processing wax, and impression wax.

1. Pattern wax

Many dental restorations or prostheses are first made with pattern waxes. The wax is later replaced with the permanent material, e.g. cast gold alloys, cobalt-chromium-nickel alloys, or polymethyl methacrylate resin.

Types

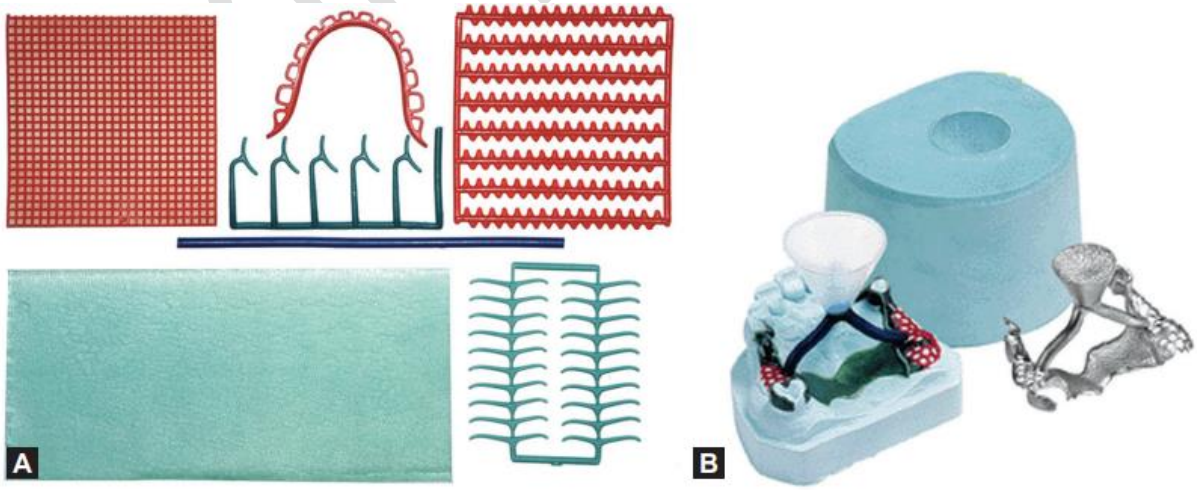
1. Casting waxes
   – Inlay
   – Removable partial denture (the metal frame)
   – Milling or machinable wax
2. Baseplate wax (used in the construction of complete and partial denture).

inlay casting wax

Supplied as blue, green or purple sticks or cakes. Used for inlays, crowns and fixed partial dentures. It is first made in wax and then replaced by metal during casting.

Removable partial denture casting wax

Supplied as sheets and a variety of ready-made forms, such as round, half-round, and half-pear-shaped rods and wires of various gauges. Used to make patterns of the metallic framework and sprues of removable partial dentures.



Milling or machinable casting wax

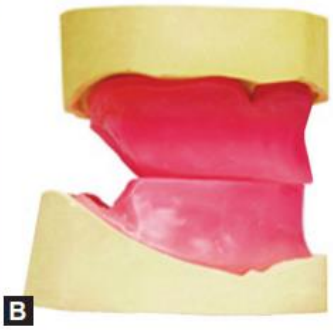
It Supplied as Blocks, Cylinders, Discs or Cakes in containers. It can be shaped by milling or machining using CAD/CAM or dental drills. Used for inlays, crowns and FPDs. It is harder and has a higher melting temperature than most other waxes.

Baseplate wax

Supplied As sheets of pink or red color.

Uses:

1. To make occlusion rims.
2. To form the contour of the denture after teeth are set.
3. To make patterns for orthodontic appliances.



2. Processing wax

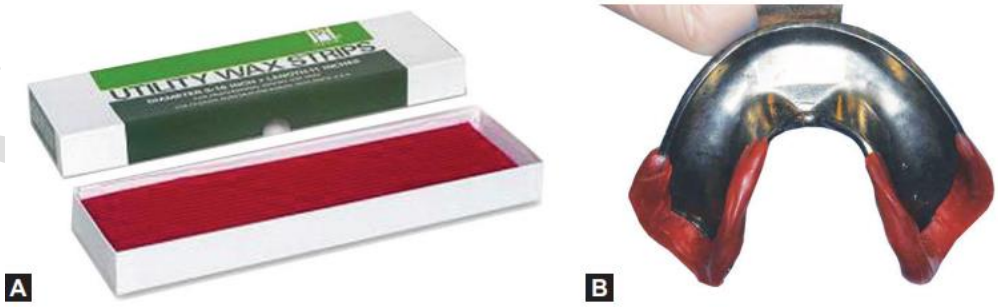
These are those waxes used mainly as accessory aids in the construction of restorations.

Boxing wax and Beading wax

Boxing wax supplied as sheets, beading wax as strips. Used to box the impression, in order to pour the stone and make a cast.

Utility wax

Supplied as sticks and sheets. used to adjust contour of perforated tray for use with hydrocolloids.



Sticky wax

Supplied as orange-colored wax in the form of stick. Used for joining metal parts before soldering and for joining broken dentures before repair procedure.

3. Impression waxes

Bite registration wax

Supplied as U-shaped rods. Used to record the relationship between the upper and lower teeth to mount the casts correctly in the articulator.