Moulding materials

Forming materials (also **puttying materials**) are used to seal the pre-shape of the replacement and its casting from the final material. To create an exact form that coincides in details and volume with the surface of the replacement model is the basic function of molding materials. They are part of an **indirect denture manufacturing** workflow, such as the lost core or shell casting method.

Basic requirements for moulding materials

- **High accuracy of size and detail reproduction.**
- **Mechanical resistance** (strength).
- **Smooth surface** (due to the einkornization of the material).
- An **expansion** that compensates for the contraction of the metal as it cools.
- **Penetration** = porosity (ensures air escape from the melt and breathability of the mold).
- **Mechanical and chemical inertness to cast materials.**
- **Reasonable setting and workability time.**
- **Fair price.**

Moulding materials

- Plaster
- Silicate = ethyl silicate, silicate
- Phosphate
- Graphite
- For titanium alloys

Gypsum moulding materials

Their basic composition is:

- **Binder** – a mixture of gypsum α-hemihydrate (β-hemihydrate or their mixture is much less firm). A small amount of powdered copper and graphite is added to the gypsum. The binder is approximately 25-45% in the total mass.
- **Sedge** – consists of three allotropic modifications of silica, which are quartz, kristobalite and tridymite, which are identical chemically but differ in crystalline structure. The sharpening makes up about 65-70% of the mass.
- **Modifiers** – these are, for example, dyes, antioxidant agents (powdered mercury, carbon) and substances affecting the rate of solidification, expansion and reducing the contraction of gypsum (boric acid, sodium chloride).

The mass is prepared by mixing the powder with water. Gypsum materials are for low-melting and medium-melting alloys (melting below 1100 °C). The minimum compressive strength is 2.4 MPa, which is important for heating and topping up the alloy. The expansion of gypsum masses during solidification is 0.2 – 0.6%.

Expansion increases when:

- Increased gypsum content.
- Increased water content.
- Increased preparation and processing time.
- Decreasing wall and hardness of the wax model.

Thermal expansion is caused by the type and amount of sharpener used. If water enters between the gypsum crystals during solidification, the gypsum begins to move away. This phenomenon is called hygroscopy and can result in undesirable and uncontrollable expansion of up to 2% = hygroscopic expansion.

Silicate moulding materials

Their basic component is silicon dioxide in the form of quartz and cristrite, which is mixed with silica gel. They are for alloys melting above 1100 °C, i.e. high-melting alloys from base metals and for the production of partial removable denture structures.

Phosphate moulding materials

Today it is one of the most widely used types of moulding materials.

The basic components of matter are:

- **Sedge** – most often christobalite, possibly mixed with quartz. Of the whole mass, sharpening forms 80%.
- **Binder** – a mixture of magnesium oxide and ammonium phosphate.
- **Modifiers** – carbon, which ensures a clean surface of the casting.

Mix the filler with water or a special liquid, which must be lukewarm so as not to prolong the setting time. As an additive, a special colloidal solution of quartz with a concentration of 33% is also used to increase expansion.

Solidification reaction:

$NH_4H_2PO_4 + MgO + 5H_2O \Rightarrow MgNH_4PO_4 + 6H_2O$ -> heating => dehydration -> at a temperature of 300-650 °C Mg2P2O7 is formed

In phosphate masses, ammonium dihydrogen phosphate enters into a solidification reaction, when it reacts with magnesium oxide and water to form magnesium-ammonium phosphate and water. During heating, the substance dehydrates and at temperatures between 300-650 °C, the substance turns into non-crystalline magnesium pyrophosphate, which then crystallizes into its final form.

Phosphate masses have a significantly higher expansion than gypsum masses. The time of their processing depends on the temperature (the higher the temperature, the faster they solidify). They are very strong and are used for base metal alloys, silver-palaladium, gold palladium, titanium alloys and for creating casting molds for ceramics and glass ceramics.

Graphite moulding materials

Their basis is carbon. They react adversely with palladium.

Moulding materials for titanium alloys

They are cast at temperatures above 1700 °C. Ceramic materials are used as sharpeners, especially pure corundum and zirconium dioxide. A suspension of a special ceramic mass is always first applied to the surface of the wax model and only after it dries, the model can be poured into the molding mass.

Links

Related articles

- Impression material
- Modeling materials
- Auxiliary prothetic materials

Literature

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