

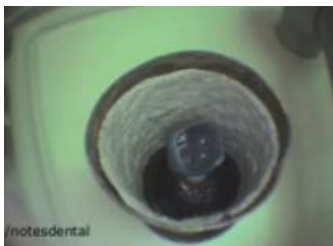
Casting Investments Materials

Casting (1) The process by which a wax pattern is converted to a metallic replica of a prepared tooth restoration. (2) A dental restoration formed by the solidification of a molten metal in a mold.

- The process requires a die that duplicates the oral tissue needing a replacement or prosthesis.
- A wax pattern of the prosthesis is built on the laboratory indirect die by carving wax to the exact dimension.



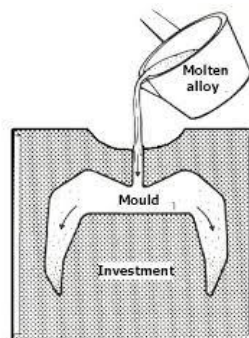
- The wax pattern is then removed from the die and placed in a casting ring to be filled with investment materials.



- After the investment sets, the casting ring is heated to melt and burn out the wax.



- The investment material in the casting ring is now a negative of the final prosthesis.



- The negative mold is then filled with molten metal. After the metal cools, the investment is fragmented and removed, leaving the prosthesis.



Investment: A molding material that surrounds the pattern and subsequently hardens and forms the mold after the wax pattern is eliminated.

Requirements of Investment Materials:

1. Easily manipulated: Not only should it be possible to mix and manipulate the mass readily and to paint the wax pattern easily, but the investment should also harden within a relatively short time.
2. The material for making the mold must be refractory and thermally stable so that it can withstand exposure to the high temperatures of molten metal as the metal solidifies and cools to room temperature.
3. Sufficient expansion: It must expand enough to compensate for shrinkage of the wax pattern and metal that takes place during the casting procedure.
4. Ease of divestment: The investment should break away readily from the surface of the metal and should not have reacted chemically with it.

Composition of Investment Materials: In general, an investment is a mixture of three distinct types of materials:

1. Refractory material.
2. Binder material.
3. Other chemicals.

Types of Investment Materials:

1. Gypsum-Bonded Investments:

This type is used for casting gold alloys.

There are two types: type 1 is used for casting inlays, onlays, crowns, or other fixed prostheses, and

type 2 is used for removable partial denture frameworks.

Composition: * α -hemihydrate of gypsum as binder that holds the filler together and provides the investment strength (When the binder is heated at temperatures sufficiently high to completely dehydrate the investment, it shrinks considerably, and occasionally fractures), *polymorphs of silica as fillers to compensate for the inherent contraction associated



with gypsum and casting shrinkage, and *other ingredients as modifiers, coloring matter, and reducing agents, such as carbon and powdered copper, are present. The reducing agents are used to provide a nonoxidizing atmosphere in the mold when a gold alloy is cast. Some of the modifiers not only regulate the setting expansion and the setting time but also prevent most of the shrinkage of gypsum when it is heated above 300 °C. In some instances, the modifiers are needed to regulate the setting time and setting expansion,

It is imperative that gypsum investments not be heated above 700 °C.

The setting expansion of these investments is controlled by retarders and accelerators for the gypsum. Hygroscopic setting expansion may be six or more times greater than the normal setting expansion of a dental investment.

Gypsum-based investments should be stored in airtight and moisture-proof containers. During use, the containers should be opened for as short a time as possible.

Phosphate-Bonded Investment:

Phosphate-based investments are designed primarily for alloys used to produce copings or frameworks for metal-ceramic prostheses and some base-metal alloy because the use of alloys with higher melting temperature ranges, such as those for metal-ceramic restorations, usually leads to greater thermal contraction after solidification. This necessitates an investment material that is more heat resistant with greater expansion.

Composition: *refractory fillers which is silica filler is typically 80% by weight. The particle size varies from submicron to that of a fine sand.* The binder consists of magnesium oxide (basic) and monoammonium phosphate (acidic). A colloidal silica suspension in place of water is used for mixing phosphate investments to increase the setting expansion.

The detail reproduction and surface smoothness of a metal-ceramic gold cast in a phosphate-bonded investment are considered inferior to those of a conventional gold alloy cast in a gypsum-bonded investment.

2. Ethyl Silicate–Bonded Investment:

This type of investment can be heated to between 1090 and 1180 °C and is compatible with the higher-fusing alloys. Its low setting expansion minimizes distortion.

Composition: *The binder is a silica gel that reverts to silica (cristobalite) on heating, and the *fillers are silicas and magnesium oxide.

Ethyl silicate has the disadvantage of giving off flammable components (alcohol) during processing, and the method is expensive.