INVESTMENT MATERIALS

Prof. Dr.

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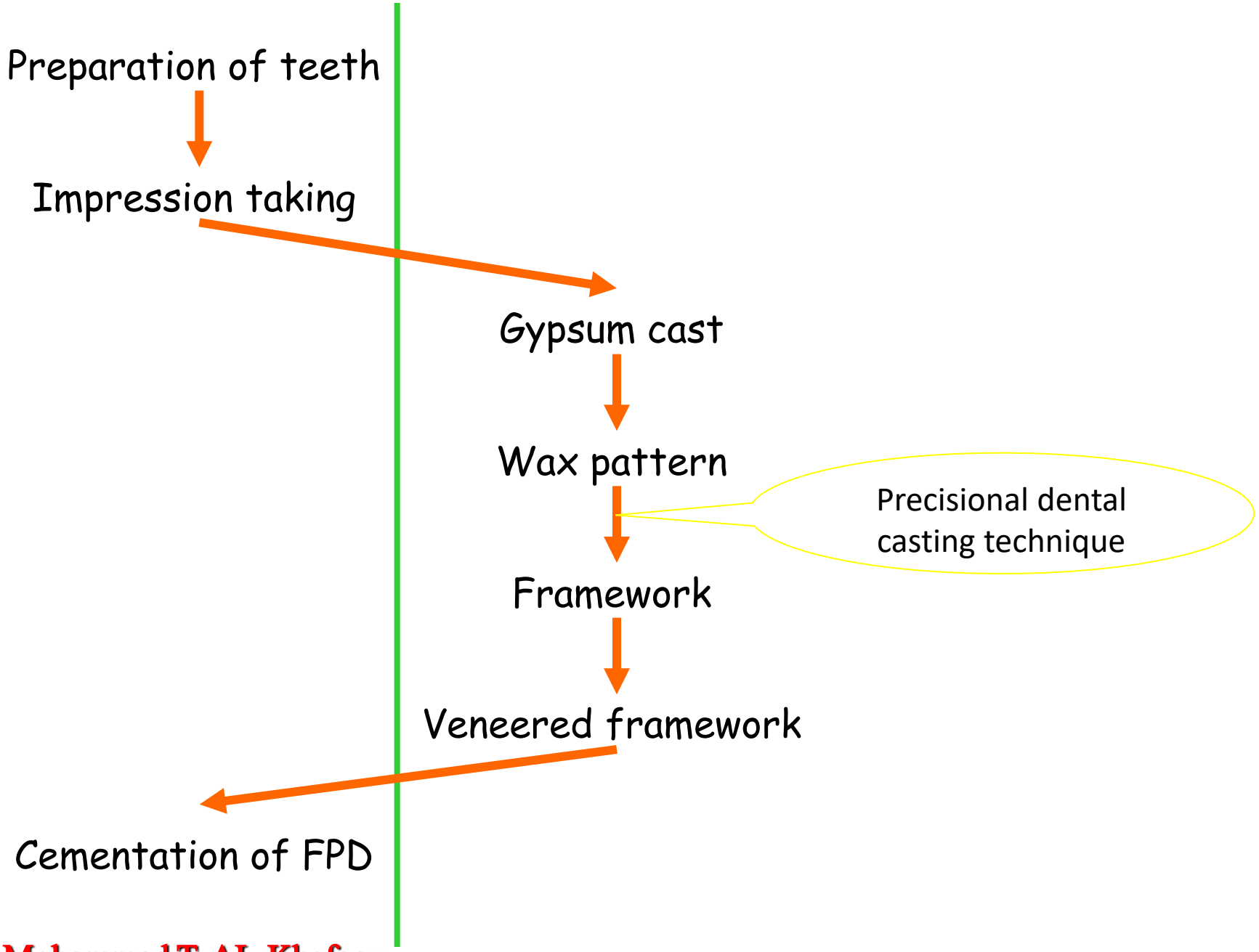
INVESTMENT MATERIALS

It is a ceramic material used to form a mold into which an alloy is cast.

This lec .....

- What is the meaning of casting
- What are the techniques which are used to shape the metal restorations such as crown and bridges and metal base RPD
- What are the materials used in this techniques
- What are the ideal properties of these materials (investment materials)
- What are the main types of investment materials.



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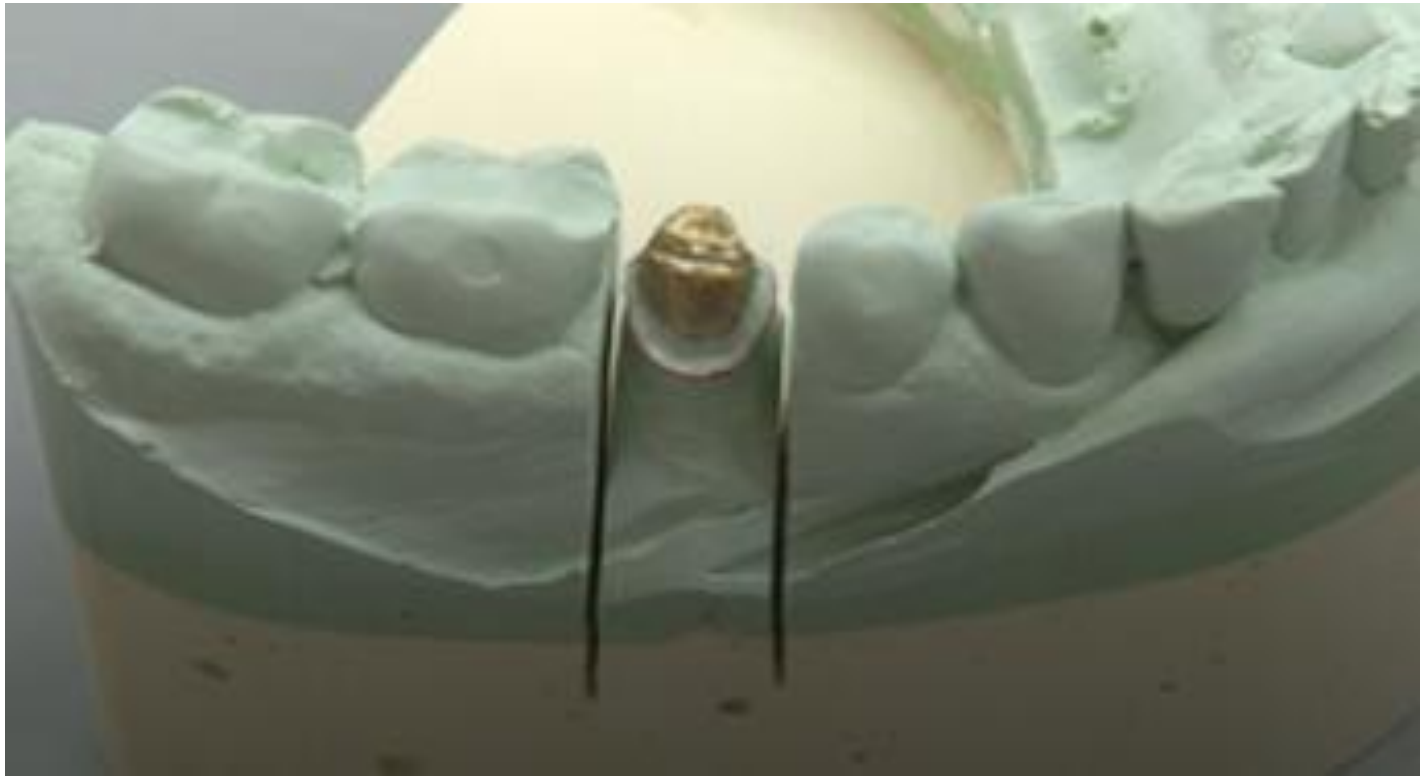
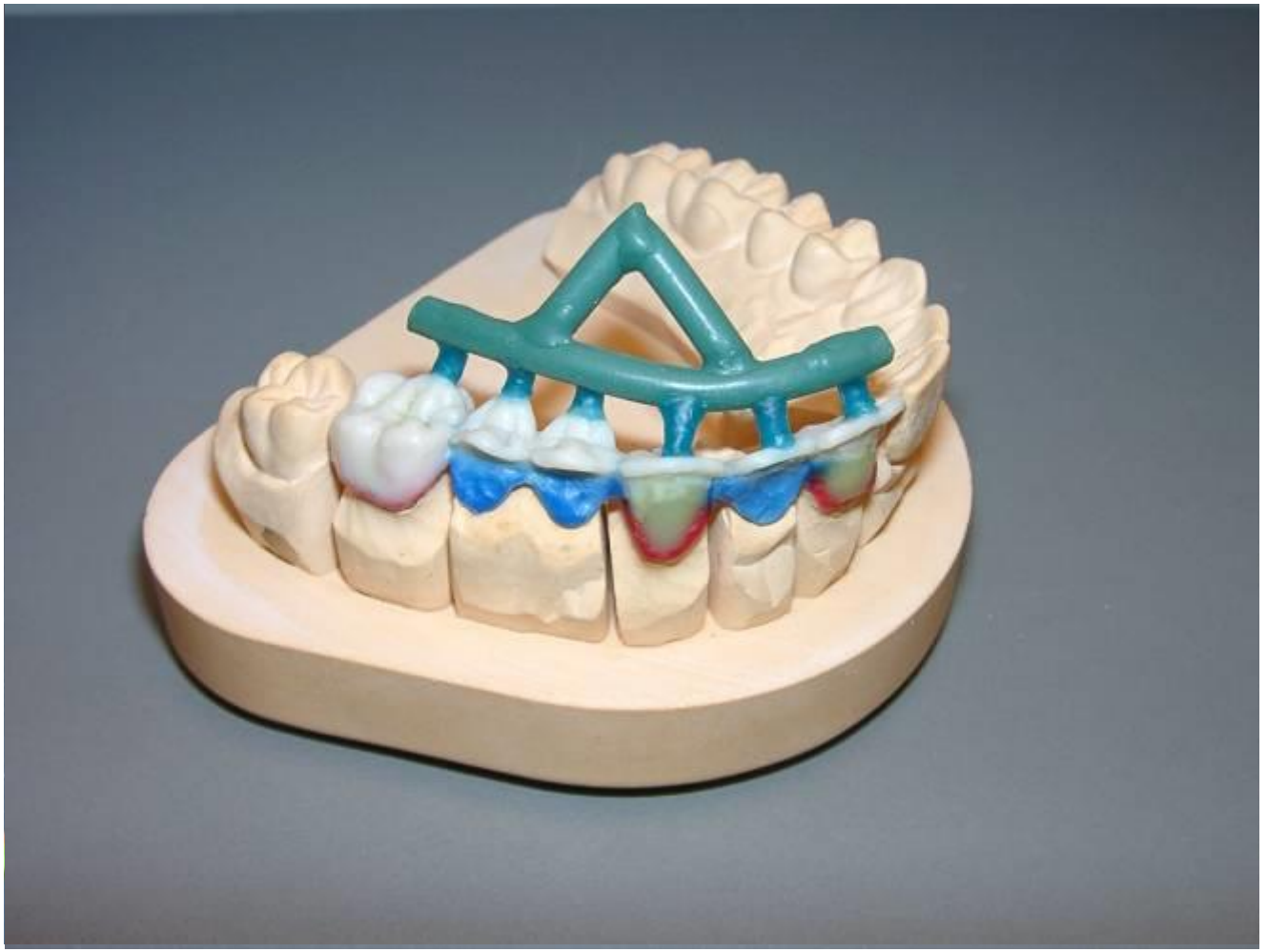
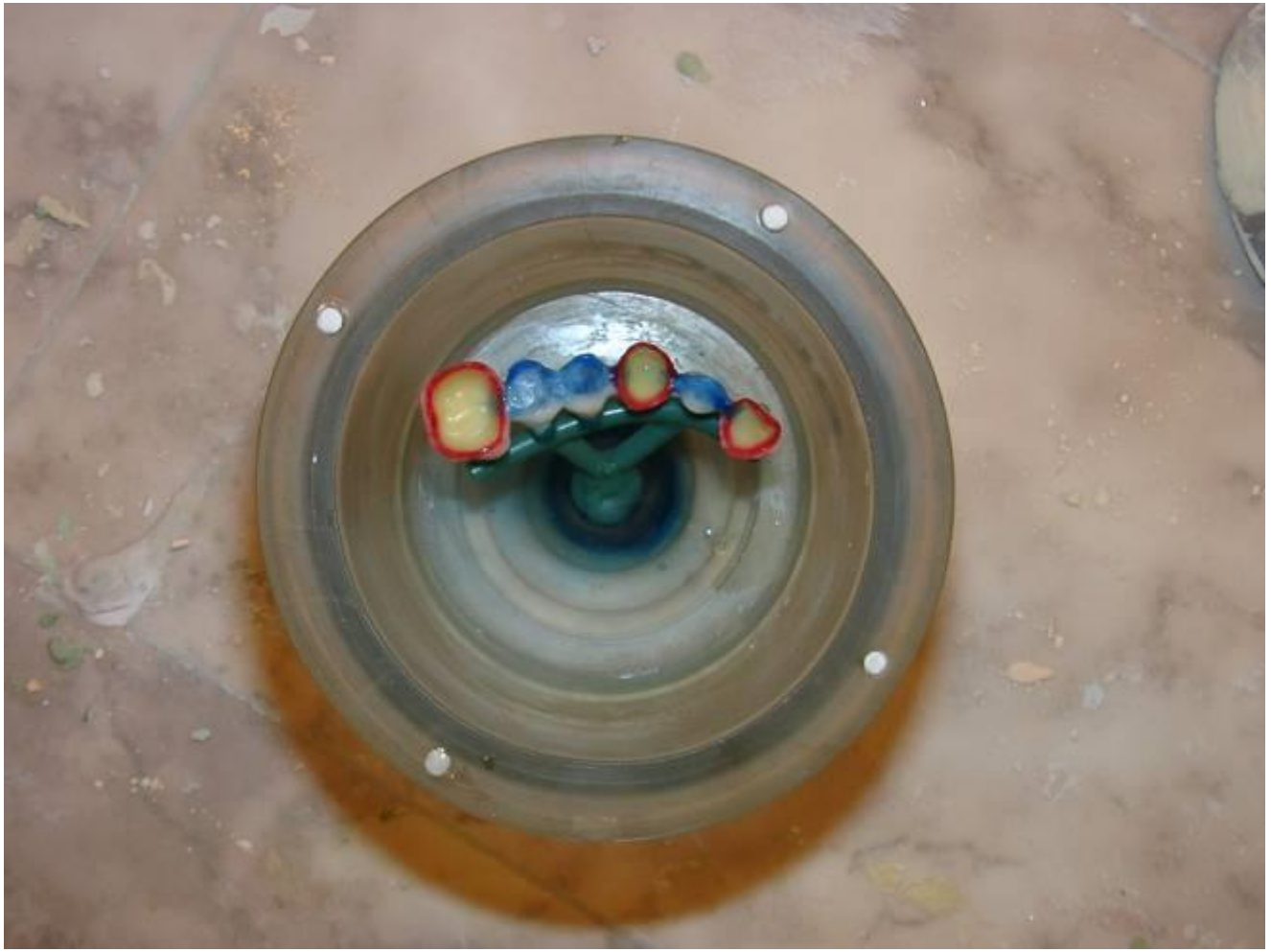


Sprueing the wax pattern



Investing the wax pattern



The casting ring **with** the wax pattern

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Investing the wax pattern

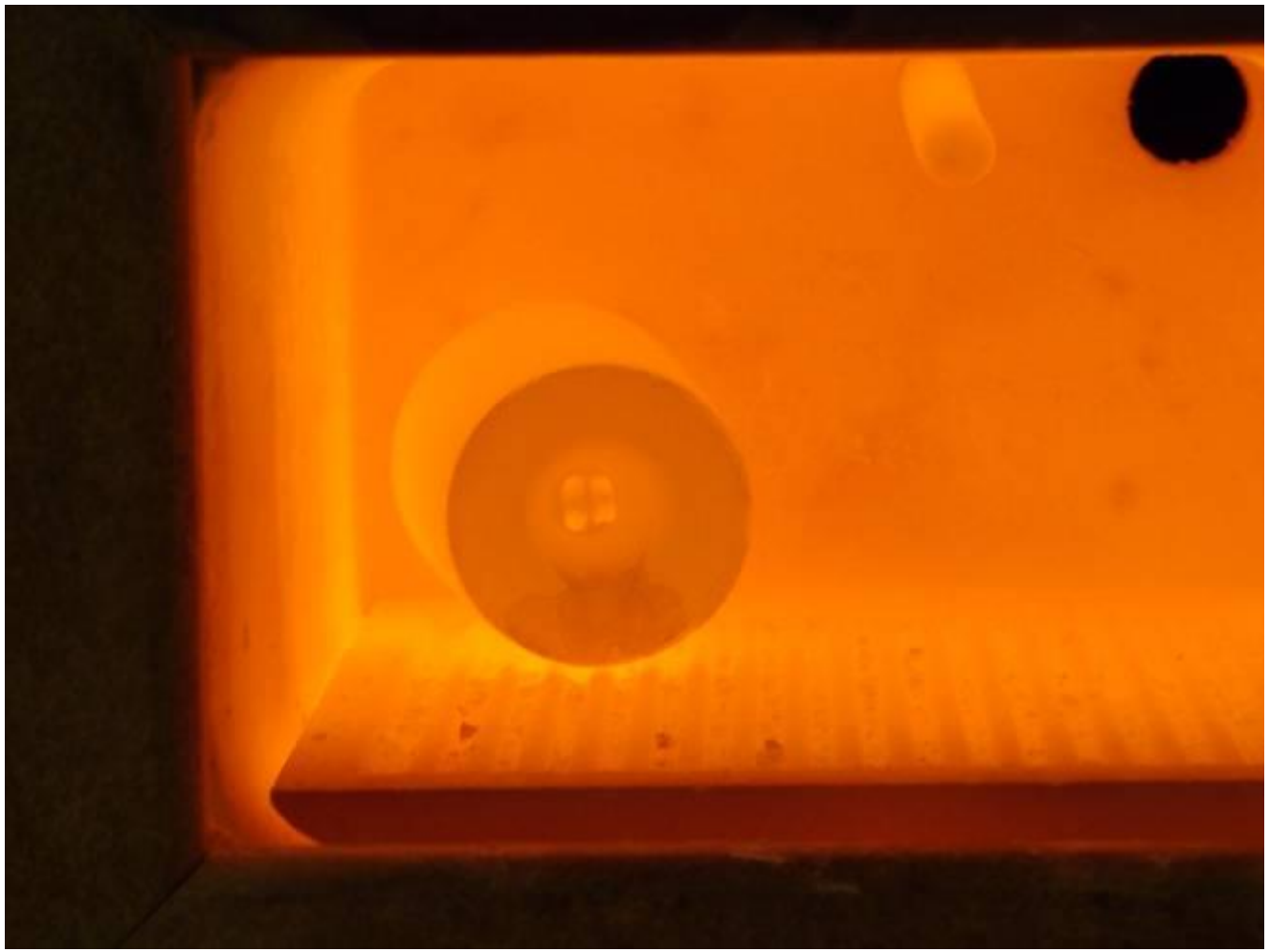
Investing the wax pattern

Investing the wax pattern

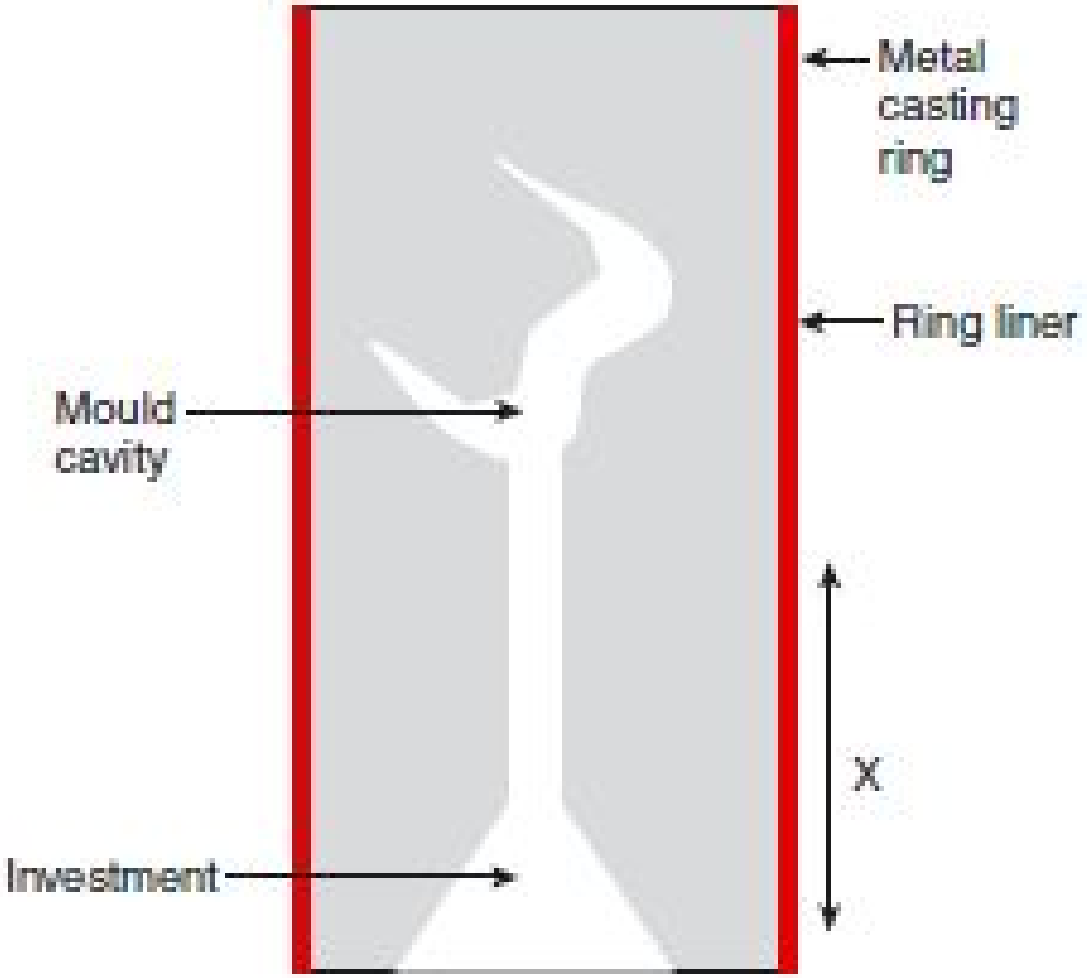
Setting expansion

Burning out the wax pattern

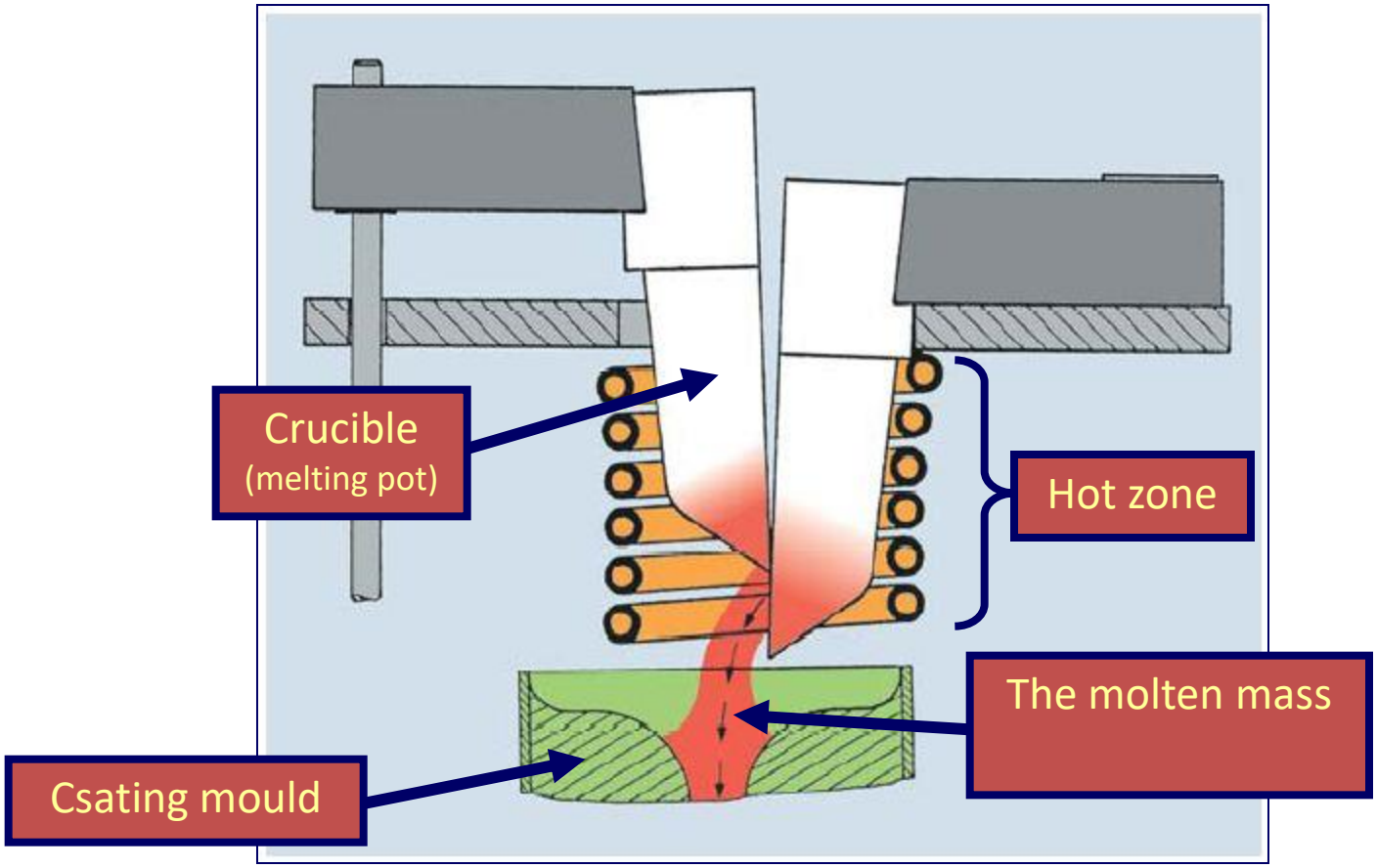
Thermal expansion



… in the furnace


Metal casting ring
Ring liner
Mould cavity
X
Investment

Casting the dental alloy



Casting the dental alloy

Casting the dental alloy

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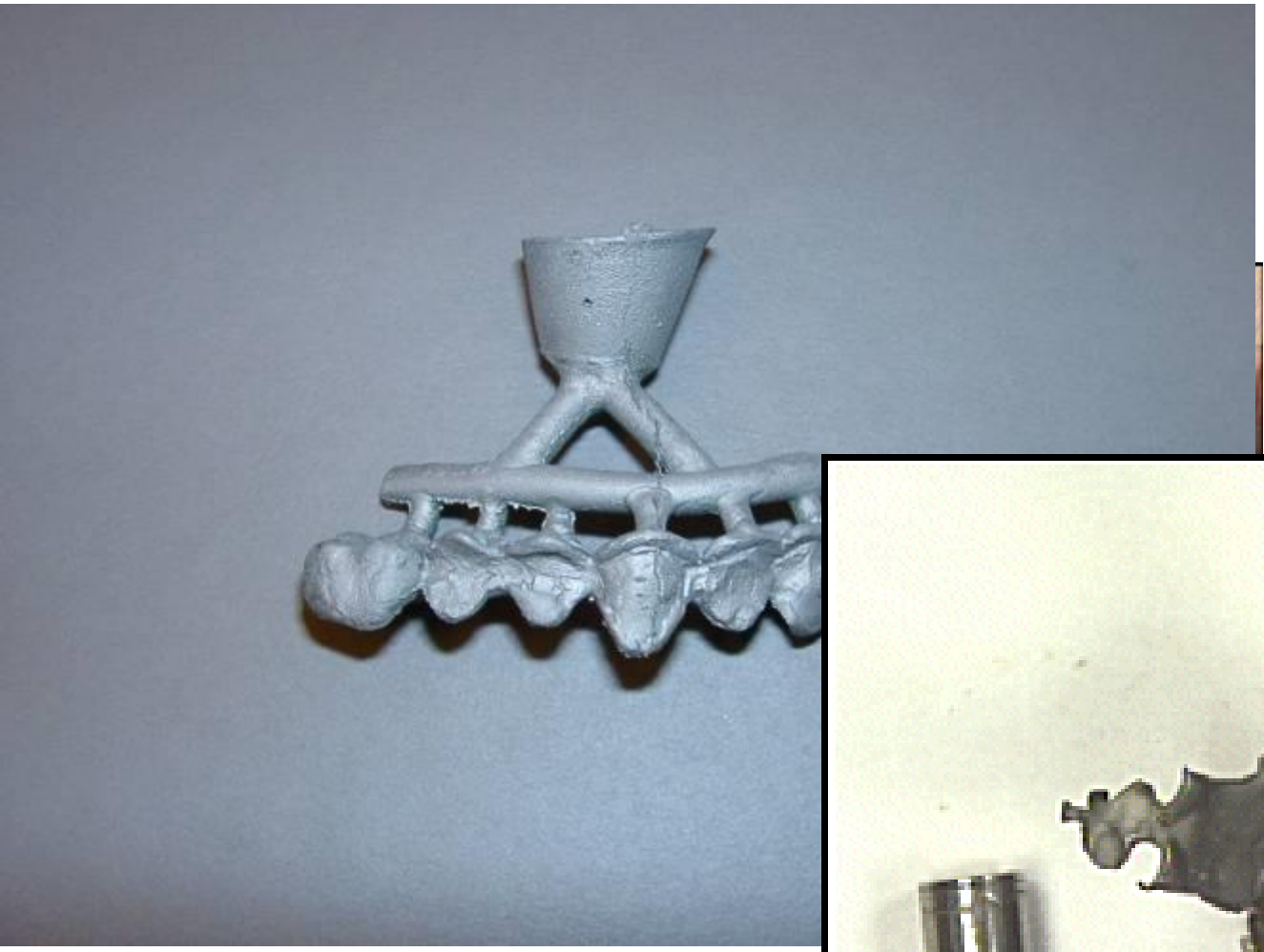
Deflasking the cast

Long cooling time

Sandblasting the framework



Finishing the framework

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Investment material

Requirements of an *ideal* investment material

1. The investment mold must expand to compensate for the alloy shrinkage, which occurs during the cooling of the molten alloy.
2. The powder should have a fine particle size to give a smooth surface to the casting.
3. Manipulation should be easy.
   - It should have a suitable setting time.

4. The material should have a smooth consistency when mixed.

Requirements of an *ideal* investment material

5. The set material should be porous enough to permit air in the mold cavity to escape easily during casting.
6. At higher temperatures, the investment must not decompose to give off gases that may corrode the surface of the alloy.
7. It must have adequate strength at room temperature to permit handling, and enough strength at higher temperatures to withstand the impact force of the molten metal.

Requirements of an *ideal* investment material

8. Casting temperatures should not be critical.
9. After casting, it should break away readily from the surface of the metal and should not react chemically with it.
10. The material should be economical.

Investment compositions.

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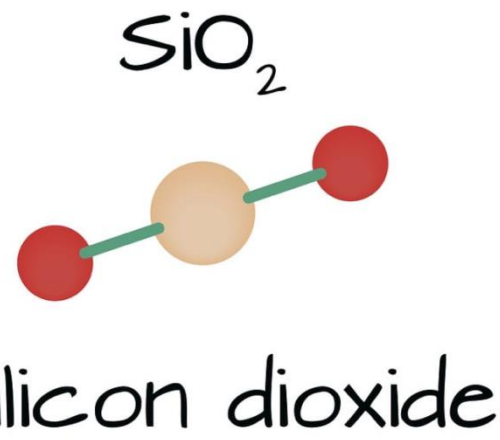
Each type of investment should be composed of:

1. **Refractory material:** A material that will withstand high temperatures without decomposing or disintegrating and regulate the thermal expansion

like ***silicon dioxide*** such as ***quartz*** or ***cristobalite*** or a mixture of them.



Each type of investment should be composed of:

2. **Binder:** because the refractory material alone dose not form a coherent solid mass, the binder is needed

- **Alpha calcium sulphate hemi-hydrate (what is this material??)**
- is the binder for gypsum -bonded investment
- **Phosphate** for phosphate -bonded investment
- **Silicate** for ethyl silicate-bonded investment

Each type of investment should be composed of:

3. Modifiers: to modify the physical properties such as **sodium chloride,** **boric acid** and **potassium sulphate.**

Types of investment materials:

1. ***Low temperature casting investment:*** gypsum –bonded investment
2. ***High temperature casting investment:*** phosphate –bonded investment and ethyl silicate-bonded investment

Gypsum bonded investment

Uses; It is used to form mold for casting ***gold alloys*** for crown and bridges

Manipulation

The powder is mixed with water and poured around the wax pattern and allow to set.

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Gypsum bonded investment

Properties

1. Thermal, setting and hygroscopic expansion is about 1.3%-2%
2. It will decompose to sulfur dioxide and sulfur trioxide when heated above 700 ^{o}C therefore it is not used for casting Co-Cr or Ni-Cr alloys but used for gold alloy
3. Three types of expansion may develop; setting, thermal and hygroscopic expansion.

Phosphate bonded investment:

Uses: to form mold for high temp casting like Co/Cr, Ni-Cr and palladium based alloys.

Compositions

Powder: silica dioxide 80%, ammonium diacid phosphate 20%, and magnesium oxide.

liquid is colloidal silica suspended in water.

The powder is mixed with the liquid and poured around the wax pattern and allowed to set for 15-30 minute.

Ethyl silicate -bonded investment:

The same ***uses*** as phosphate -bonded investment.

It is composed of ***powder*** which is silica dioxide, magnesium oxide

The ***liquid*** is composed of ethyl silicate and denaturized acid.

Expansion is about 1.7-2.1%

All ceramic crown investment:

- It is phosphate bonded, contained fine-grained refractory fillers to allow accurate reproduction of details and remain undamaged during the firing of ceramic.

Soldering investment:

- It is composed of quartz and calcium sulphate hemihydrate binder for low melting point alloys.