Wax elimination (Burn out) and casting lect 15&16

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WAX ELIMINATION

Wax elimination or burnout consists of heating the investment in a thermostatically controlled furnace until all traces of the wax is vaporized, thereby forming a cavity into which the molten metal is cast.

STEP-BY-STEP PROCEDURE

1. Allow the investment to set for the recommended time (usually 1 hour) and then remove the rubber crucible former. If a metal sprue is used, remove it as well. The smooth skin that forms on the ring with phosphate- bonded investments should be removed, and any loose particles of investment should be blown off with compressed air.

2. Reexamine the ring for any residual particles and then place it with the sprue facing down in the furnace on a ribbed tray. The tray allows the molten wax to flow out freely.

3. Bring the furnace to 200° C (400° F) and hold this temperature for 30 minutes. Most of the wax is eliminated by this time.

Burnout of wax

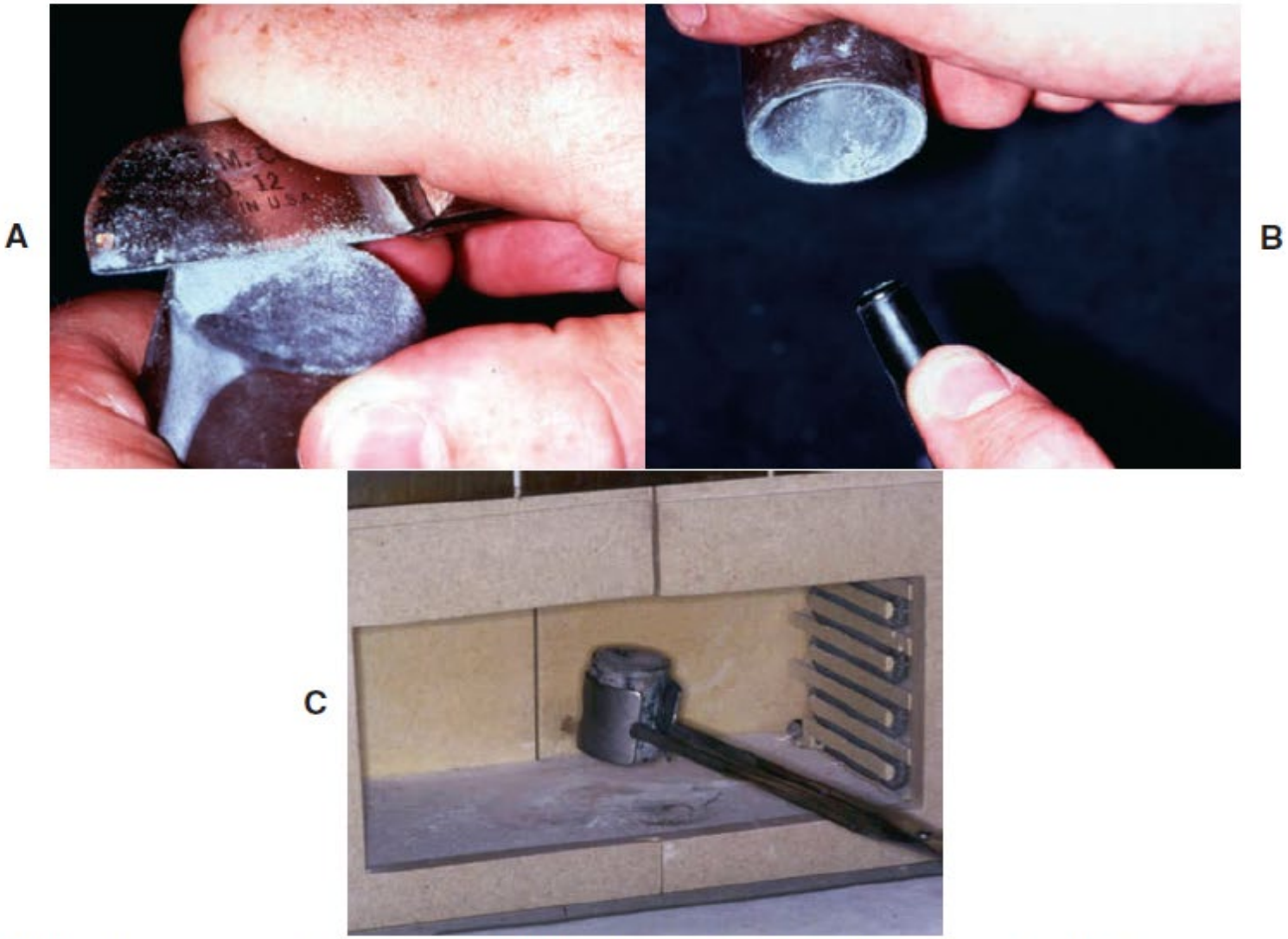
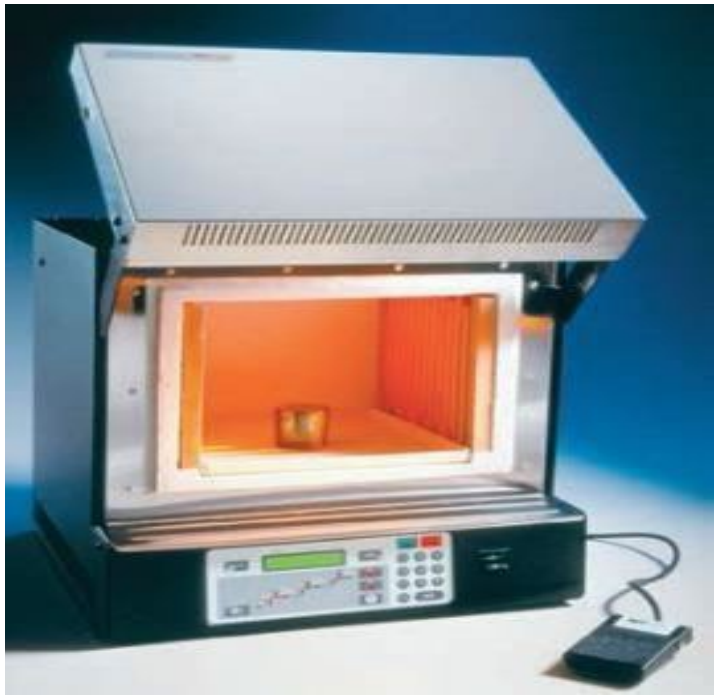


FIGURE 22-20 ■ **A,** When the investment has set, the "skin" at the top of the ring is trimmed off. **B,** The rubber crucible former is removed, and any loose particles of investment are blown off. **C,** The ring is then placed in the furnace for the recommended burnout schedule.

4. Increase the heat to the final burnout temperature (generally 650° C or 480°C if a hygroscopic technique is used); follow the manufacturer's instructions) and hold for 45 minutes.

5. The mold is now ready for casting, although a large casting ring usually requires increased heating time. The investment should not be overheated or kept at temperature too long. Gypsum-bonded investments are not stable above 650 ° C, also some carbon in carbon-containing investments burns off, causing increased surface roughness of the casting.



CASTING

CASTING MACHINES

1. A casting machine requires a heat source to melt the alloy and a casting force. For a complete casting, the casting force must be high enough to overcome the high surface tension of the molten alloy as well as the resistance of the gas within the mold.

2. The heat source can be either the reducing flame of a torch or electricity.

3. Conventional alloys can be melted with a gas-air torch but the metal-ceramic alloys in a higher melting range need a gas-oxygen torch. Base metal alloys need a multi-orifice gas-oxygen or oxyacetylene torch. Electric heating can occur by convection from a heating muffle or by the generation of an induction current in the alloy.

Gas-air casting torch

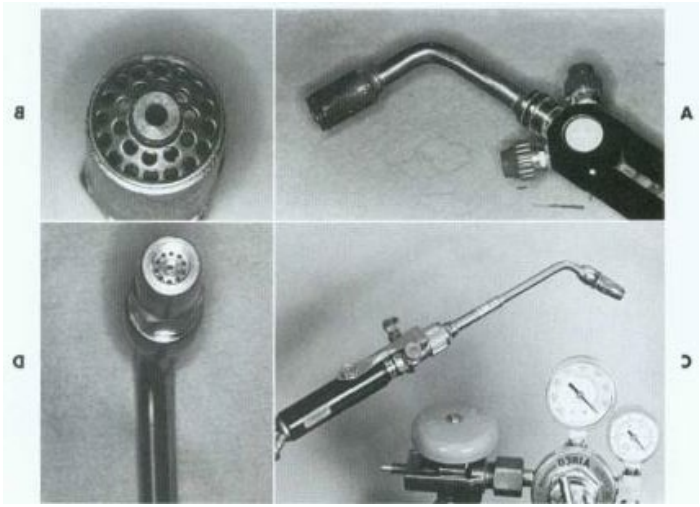


Gas-oxygen casting torch

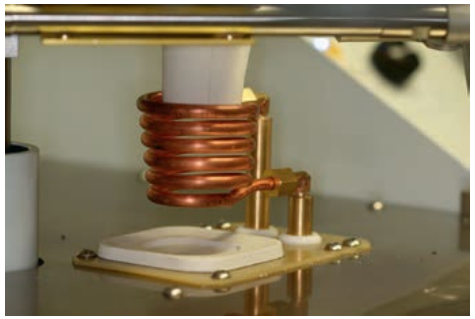


Multiorifice tip





Induction coil (electrical)



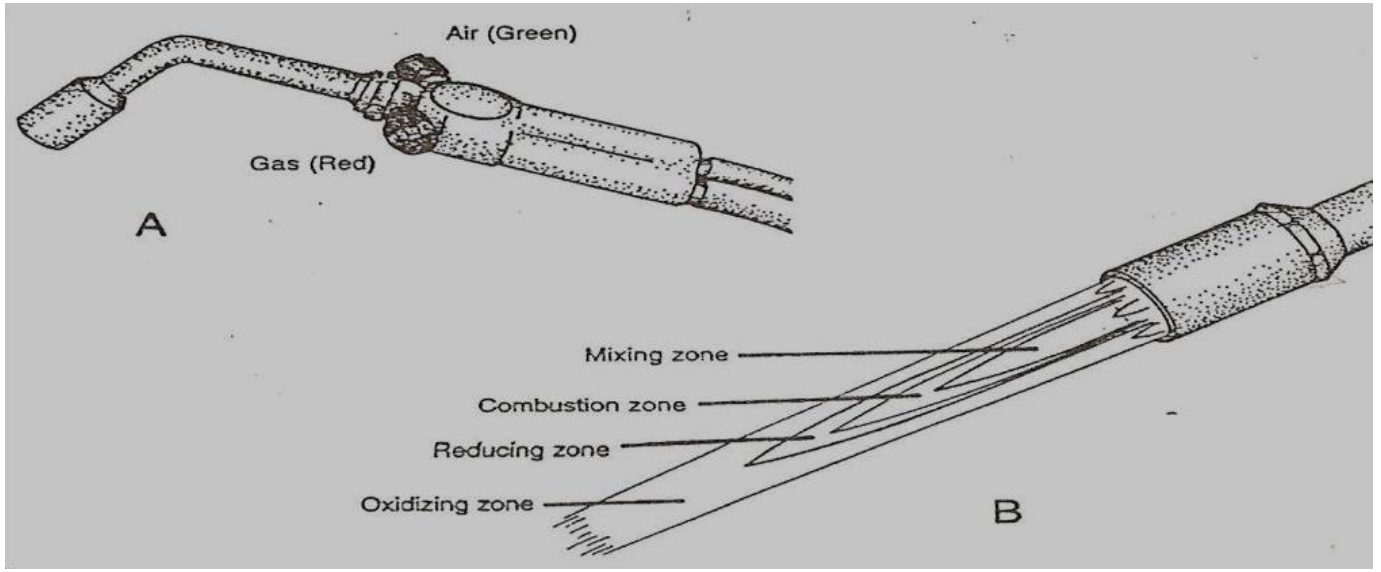
The flame used in the casting composes of 4 zones:

a- Mixing zone: It's cool, colorless zone.

b- Combustion zone: Its greenish-blue zone in which partial combustion takes place, this makes an oxidizing the alloy.

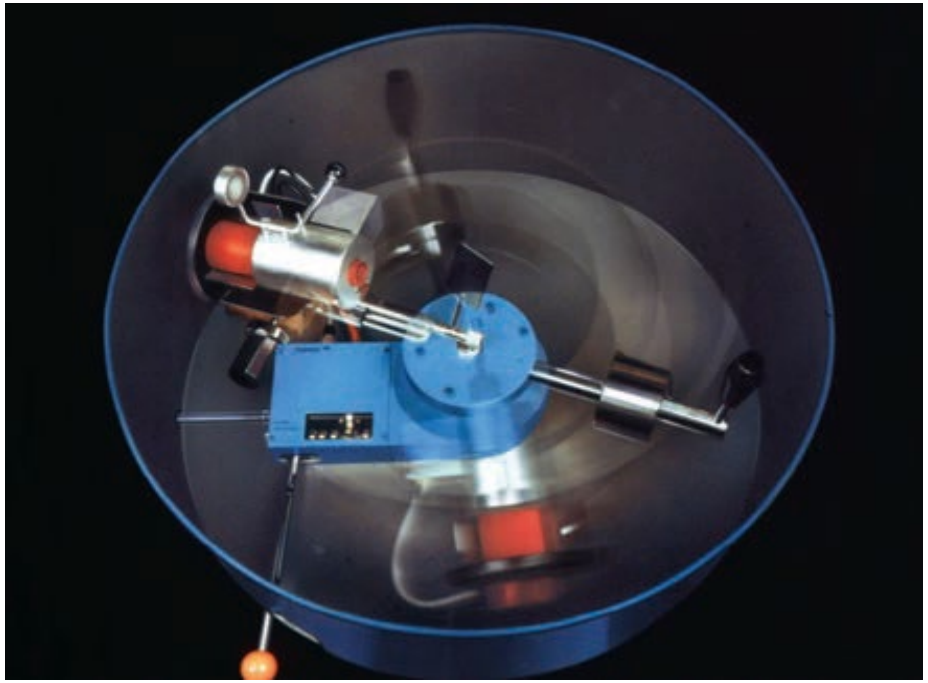
c- Reducing zone: It’s a dim blue tip it’s the hottest zone.

D-Oxidizing zone: In which final combustion between the gas and surrounding air occurs, it makes an oxidizing the alloy.



Casting machine





Casting technique

1. The crucible is preheated.



2. The alloy is melted. When the alloy is molten, the casting ring is removed from the furnace and placed in the cradle.



3. Tongs are used to slide the crucible platform into contact with the casting ring .



4. The orifice of the crucible aligns with the sprue.



5. Heating continues for a few seconds so that the melting is complete and casting can proceed.

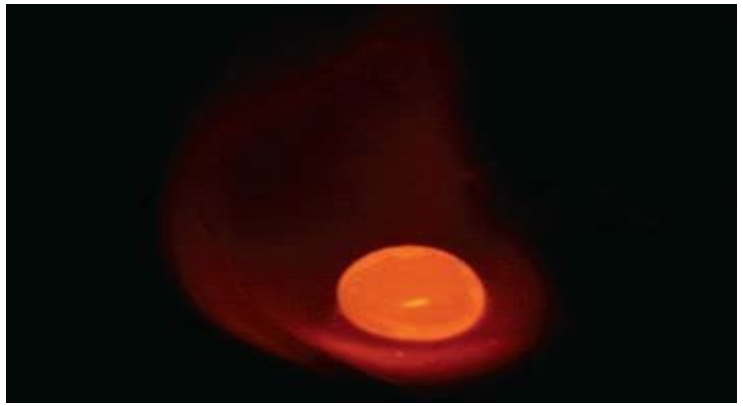


6. The casting arm is pulled forward until the pin drops .



7. The melted alloy, seconds before casting.

6 g is typically adequate for premolar and anterior castings, 9 g is adequate for molar castings, and 12 g is adequate for pontics .



8. Centrifugal force carries the melted alloy into the mold cavity.



Recovery of the Casting. After the red glow has disappeared from the button, the casting ring is plunged

under running cold water into a large rubber mixing bowl Gypsum-bonded investments disintegrate quickly, and residue is eliminated easily with a toothbrush. Final traces can be removed ultrasonically. Oxides are removed by pickling in 50% hydrochloric acid (or, preferably, a nonfuming Substitute. Phosphate-bonded investments do not disintegrate equally well, and some must be removed forcibly from the casting ring.

Recovery of casting

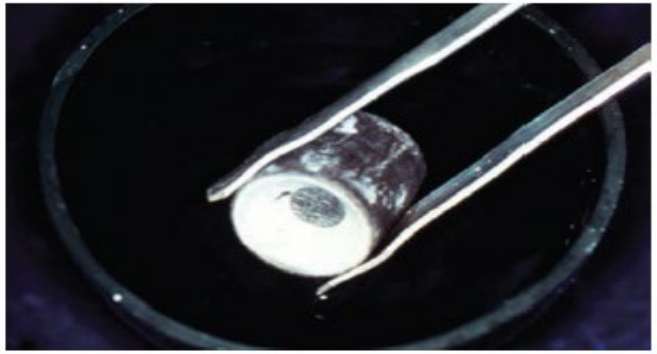


FIGURE 22-26 ■ The ring is quenched in cold water in a plaster bowl. Gypsum-bonded investments readily disintegrate; phosphate-bonded investments are much stronger and need to be devested carefully.



FIGURE 22-27 ■ Nonfuming pickling acid can be used in conjunction with this covered pickling unit.



FIGURE 22-28 ■ Recovery of a casting from phosphate-bonded investment. **A,** Trimming is done from the button end of the ring. **B,** Investment is being pushed out of the casting ring. **C,** The mold is broken open. **D,** Investment is removed from the casting. Care must be taken to avoid damaging the margin.

Evaluation

The casting is never fitted on the die until the inner surface has been carefully evaluated under magnification; even tiny imperfections can cause damage to the stone die. A die may be rendered useless in a matter of seconds if a casting is fitted prematurely.

Casting defects

TABLE 22-1 Common Causes of Casting Failure

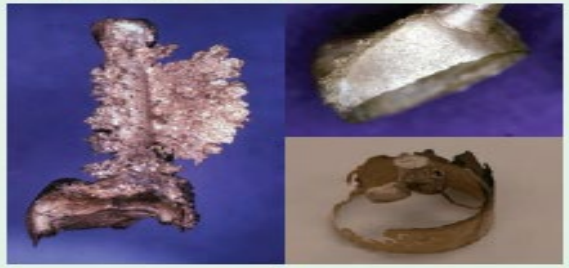
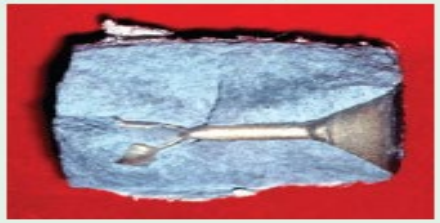
Problem	Possible Causes	Appearance
Rough casting	Excess surfactant Improper water-to-powder ratio Excessive burnout temperature	
Large nodule	Air trapped during investing procedure	
Multiple nodules	Inadequate vacuum during investing Improper brush technique Lack of surfactant	
Nodules on occlusal surface	Excessive vibration	
Fins	Increased water-to-powder ratio Pattern too near edge of investment Premature heating (mold still wet) Too-rapid heating Dropped mold	
Incomplete casting	Wax pattern too thin Cool mold or melted alloy Inadequate metal	

TABLE 22-1 Common Causes of Casting Failure—cont'd

Problem	Possible Causes	Appearance
Incomplete casting with shiny, rounded defect	Incomplete wax elimination	
Solidification shrinkage ("suck-back") porosity	Improper pattern position Narrow, long sprue	
Inclusion porosity	Particle of investment dislodged during casting	
Marginal discrepancy	Wax pattern distortion Uneven expansion	
Inadequate or excessive expansion	Improper water-to-powder ratio Improper mixing time Improper burnout temperature	