Dental Material 1

HYDROCOLLOID IMPRESSION MATERIALS

AGAR

DR NOUR ALFAKS

Reversible vs. irreversible hydrocolloids

All hydrocolloids are dimensionally stable only during a brief period of time.

They are hydrophilic materials so can gain water and expand (imbibition), so must not be immersed in water.

They lose water rapidly and shrink if exposed to air

Reversible hydrocolloids (Agar)

Agar hydrocolloid was the **first successful** elastic impression material to be used in dentistry.

The gel of agar consists primarily of a **15%** colloidal suspension of agar in **water**.

It is an organic hydrophilic colloid (**polysaccharide**) extracted from certain types of **seaweed**.

Although it is an excellent impression material and accurate impressions, presently it has been largely **replaced** by **alginate** hydrocolloid and **rubber** impression materials.

Uses

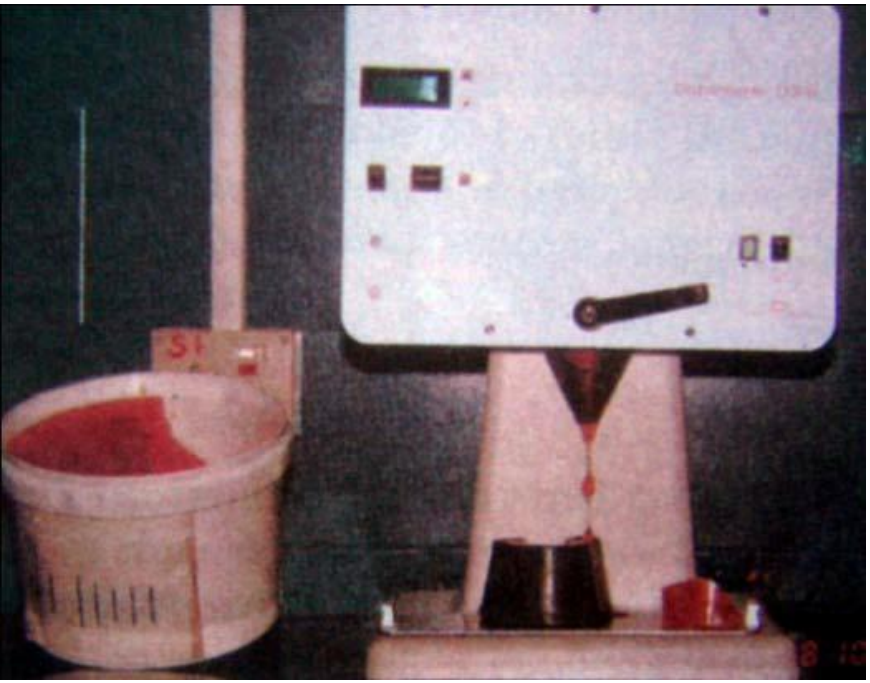
1. The primary uses of agar impression are for **partial denture and crown and bridge** patients.

For these applications, the **poor tear resistance** is considered to be their major disadvantage.

2. The materials are widely used as **laboratory duplicating materials.**

For this application their main advantage is that the material can be **reused**, a significant factor in this application where the products are used in relatively **large bulk**.

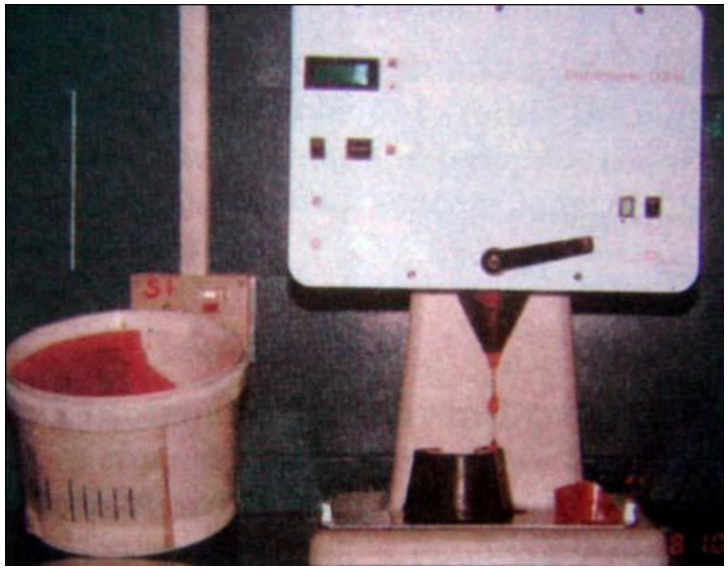
In the construction of partial dentures and orthodontic appliances it is often necessary to produce more than one cast



Supplied as

- Gel in a flexible, toothpaste-like tubes (for impressions).
- A number of cylinders in a glass jar (syringe material)
- In bulk containers (for duplication).


Van R
HEAVY BODIED
ACCULOID
SLATE
AGARLOID
Syringe Material
For Backloading



Flow

The material is sufficient fluid to record the fine details if it is correctly manipulated.

It classifies according to consistency as:

Type I **high consistency**

Type II **medium consistency**

Type III **low consistency**

In the gel form, agar is sufficiently **flexible** to be withdrawn past undercuts.

Composition

The gel consists primarily of a **15%** colloidal suspension of **agar in water.**

- Small quantities of **borax and potassium sulphate are normally present in the gel.**
- **Borax is added to give more "body" to the gel.**

Unfortunately, borax retards the setting of gypsum model and die materials and models formed in agar impression may have surfaces of poor quality.

- The presence of **potassium sulphate in the agar gel counteracts this effect of the borax, since in accelerates the setting of gypsum products, thereby ensures proper setting of the cast or die.**

Alternatively, the impression may be dipped in a solution of accelerator.

- **Wax, hard acts as filler. Fillers affect the strength, viscosity and rigidity of the gel.**

- **Thixotropic materials act as plasticizer.**
- **Alkyl benzoates act as preservative.**
- **Coloring and flavoring agents for patient comfort.**
- **Water acts as the dispersion medium.**

Manipulation

Agar hydrocolloid requires special equipment:

- Hydrocolloid conditioner
- Water cooled rim lock trays

The hydrocolloid conditioner consists of :

Boiling section or Liquefaction section

Ten minutes in boiling water (**100o C).**

The sol should be homogeneous and free of lumps.

Every time the material is reliquefied, three minutes should be added.

This is because it is more difficult to break down the agar brush heap structure after a previous use.

Storage section

65-68o C temperature is ideal. It can be stored in the sol condition till needed. At these temperatures the agar sol remains **fluid** during the day .

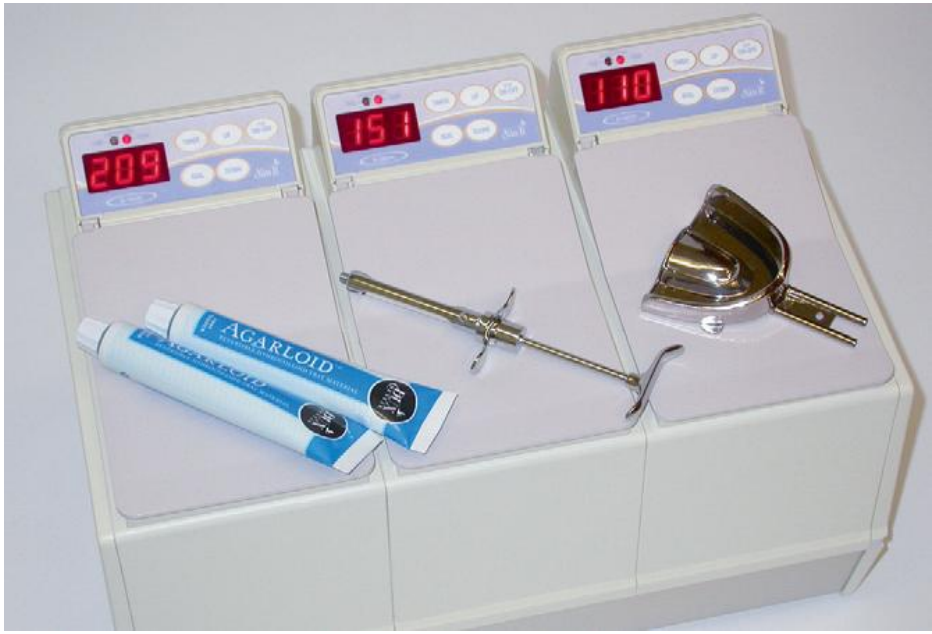
Tempering section

45o C for about **two minutes** with the material loaded in the tray.

This is done to reduce the temperature so that it can be tolerated by the sensitive oral tissues.

It also makes the material viscous.


QWIK


209
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110
AGARLOID

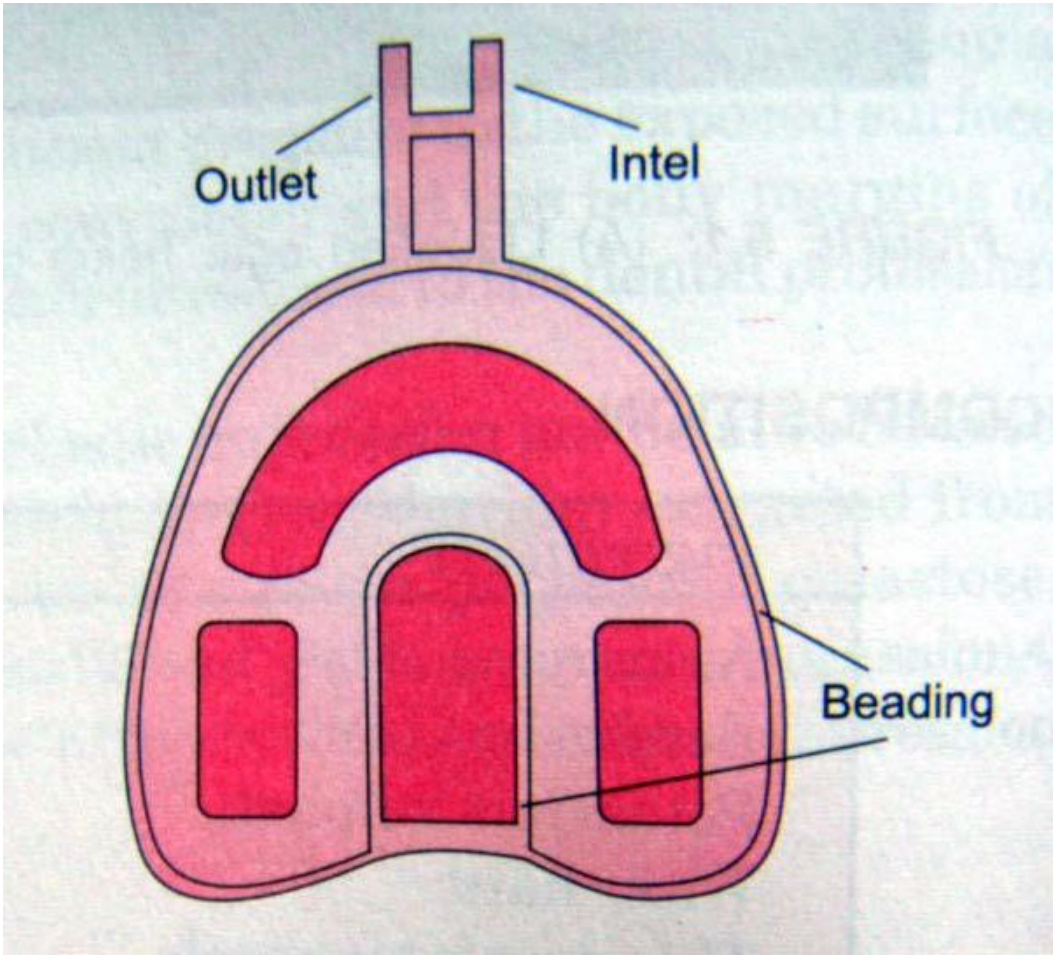
Impression trays

Rim lock trays with water circulating devices.

The rim lock is a beading on the inside edge of the tray which helps to retain the material.

It also has an inlet and outlet for connecting the water tubes.

The tray should allow a space of 3 mm **occlusally and laterally** and extend distally to cover all teeth.


Outlet
Intel
Beading

Making the impression

The tube or syringe of gel is first placed in the **100oC bath**.

This rapidly converts the gel to sol and the contents of the tube become **very fluid**.

The tube is then transferred to the **65oC** bath where it is **stored** until required for use.

This temperature is high enough to maintain the material in the **sol form**.


QWIK WASH
FAST GELLING


QWIK
REVERSIBLE HYDROCOLLO
FAST GELLING

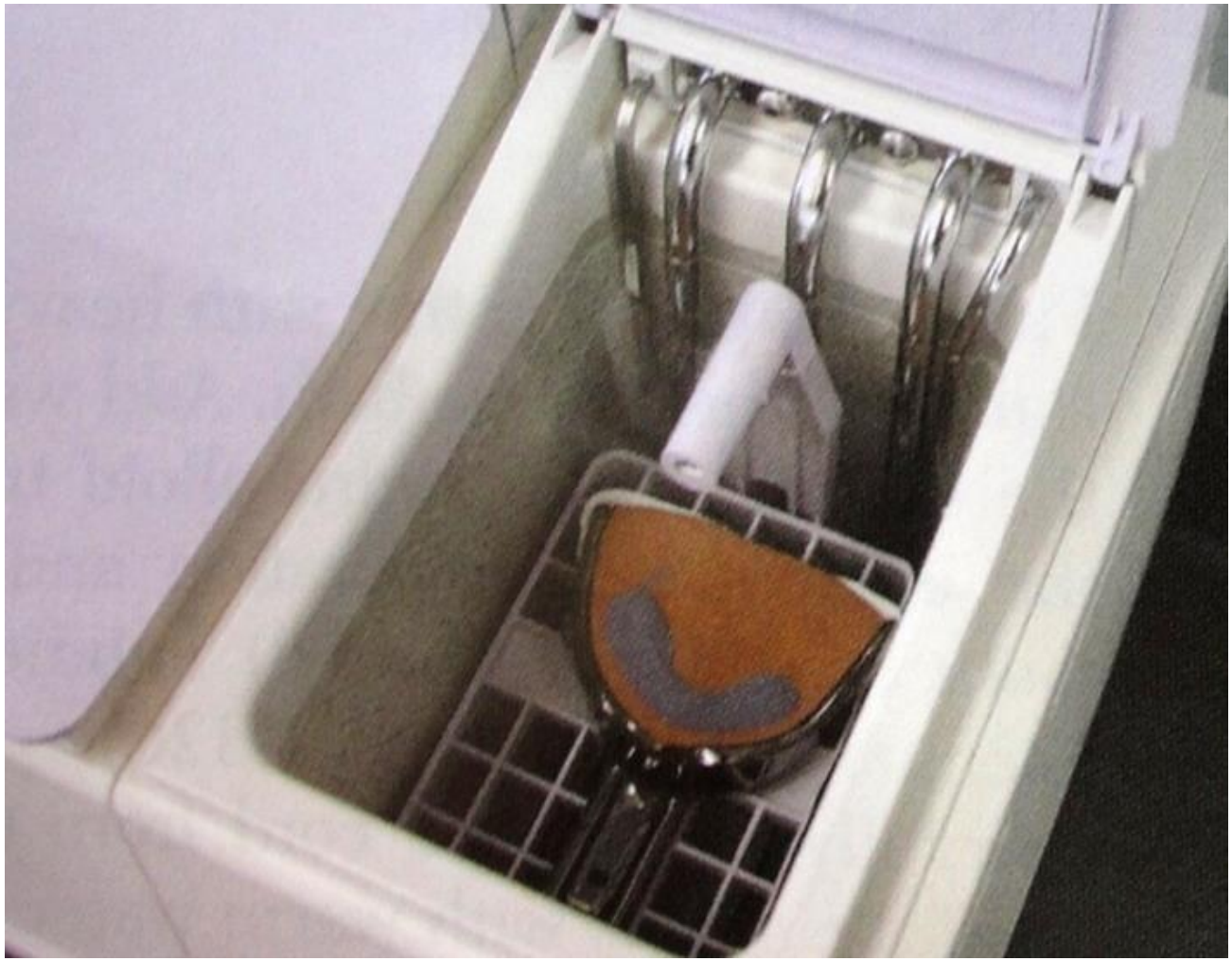
A few minutes before the impression is recorded, the contents are cooled to 45o C.

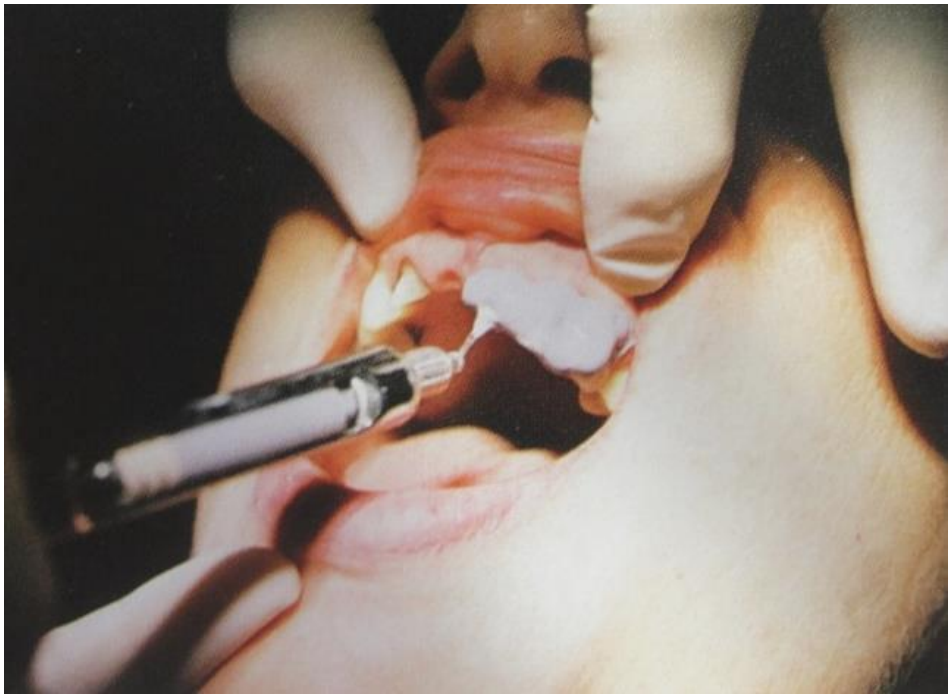
if the material is maintained at this temperature for long, it slowly begins to revert to the gel form.

When the impression is recorded, the sol is expressed from the tube into an impression tray and seated in the patient's mouth.

--Reversible hydrocolloids are available in a variety of viscosities to help us achieve high levels of accuracy for use in crown and bridge work.

A high viscosity sol is transferred from the tempering bath into a stock tray and a low viscosity material can be syringed directly onto the prepared teeth.



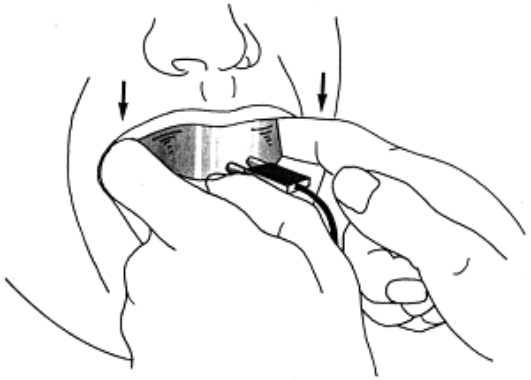


The tray is then inserted into the mouth over the teeth concerned.

The conversion from sol to gel takes place slowly at mouth temperature and it may be many minutes before the material develops sufficient elasticity to permit removal of the impression.

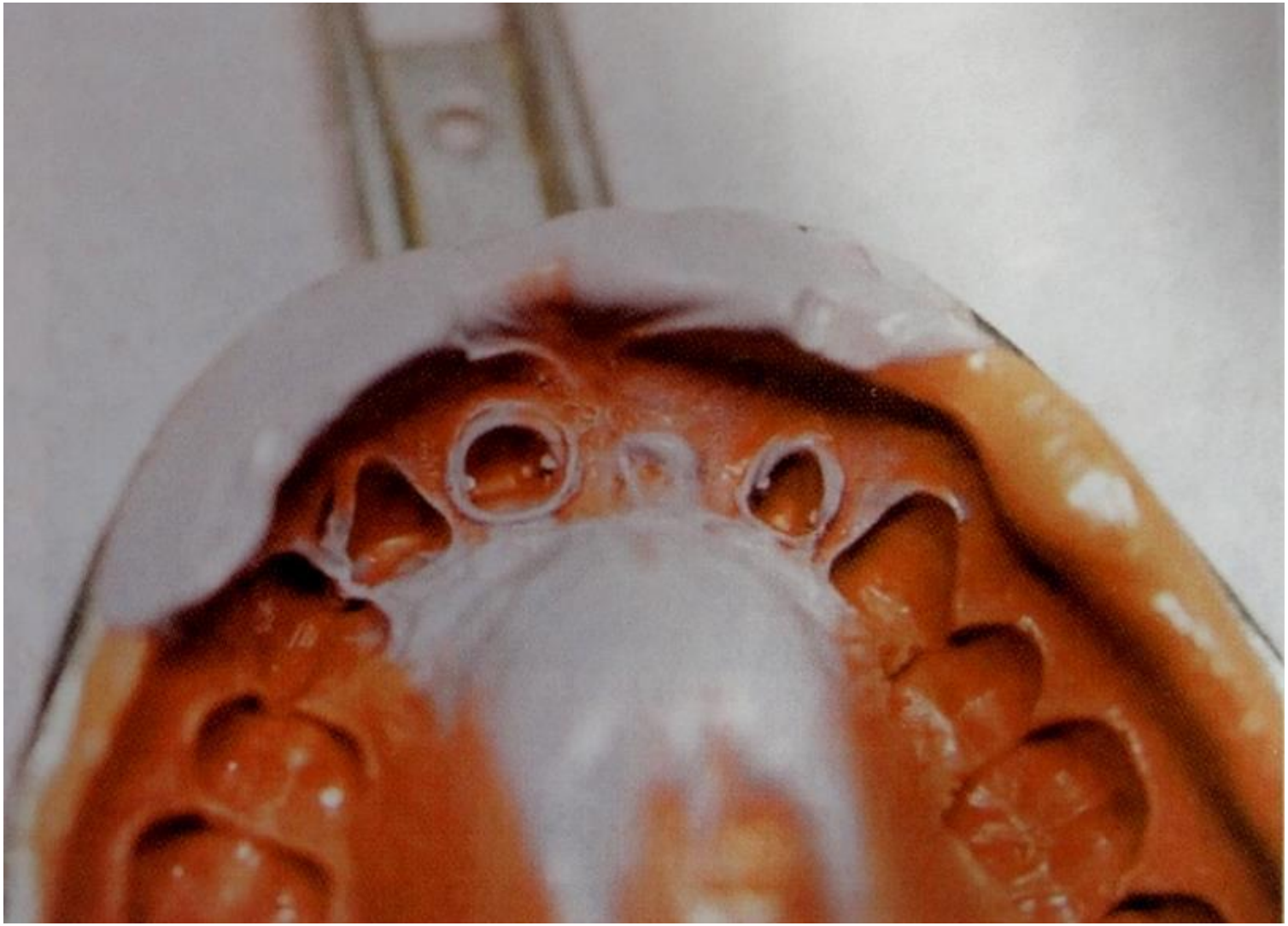
The rate of conversion of sol to gel may be accelerated by spraying cold water onto the impression tray whilst it is in the mouth, or by using water-cooled impression trays.

Removal of impression



When the agar has gelled, the peripheral seal around the impression is broken, and the impression is removed rapidly from the mouth with a single stroke or snap.

The impression is rinsed thoroughly with water and the excess water is removed by shaking the impression



Storage of agar impression

Storage of agar impression is to be avoided at all costs and no satisfactory medium for storage is available.

The cast should be poured immediately.

Storage in air results in dehydration, and storage in water results in swelling of the impression.

Storage in 100% relative humidity results in shrinkage as a result of continued formation of the agar network agglomeration.

If storage is unavoidable, it should be limited to one hour in 100% relative humidity.

Impression disinfection

Since the impression has to be sent to the laboratory, the need to disinfect it is very important.

Most manufactures recommend a specific disinfectant.

The agent may be iodorphor, bleach or glutar aldehyde.

Apparently little distortion occurs if the recommended immersion time is followed and if impression is poured promptly.

Properties of agar hydrocolloids

Syneresis and imbibition (dimensional stability)

Since hydrocolloids use water as the **dispersion medium**, they are prone for **dimensional change due to either loss or gain of water.**

If left in a dry atmosphere, water is lost by evaporation, The gel may also loose water by exuding of fluid in a process known as **"syneresis".**

and if it is immersed in water, it absorbs water by a process known as" ***imbibition".***

The material has **very poor dimensional stability-** a function of the very high water content of the gel.

Importance:

syneresis and imbibition can result in dimensional changes and therefore inaccurate casts.

To avoid this hydrocolloid impressions should be poured immediately.

Elasticity and elastic recovery

Agar hydrocolloids are highly elastic in nature and **elastic recovery occurs to the extent of 99%.**

Reproduction of detail

A reproduction of up to 25 µm (micrometers) is achievable with agar hydrocolloids.

Accuracy and dimensional change

Agar impressions are **highly accurate** at the time of removal from the mouth, but **shrink** when stored in air or 100% relative humidity and **expand** when stored in water.

The least dimensional change occurs when the impressions are stored in 100% humidity (for not more than **one hour**).

However, prompt pouring of plaster or stone models is recommended.

Working and setting time

The working time ranges between 7-15 minutes and the setting time is about 5 minutes.

Both can be controlled by regulating the flow of water through the cooling tubes.

Tear and compressive strengths

Agar has a **tear strength** of 715 gm/cm2 and **compressive strength** of 8000 gm/cm2.

The above values are for **tray materials**.

The syringe materials have poorer mechanical properties.

Laminate technique: or agar alginate combination technique

Here, after injecting the syringe agar on to the area to be recorded, an impression tray containing a mix of chilled alginate that will bond with the syringe agar is positioned on it. The alginate gels by a **chemical reaction**, whereas the agar gels by means of contact with the cool alginate rather than water circulating through the tray.

Advantage

1. The syringe agar gives better details than alginate.
2. Less air bubbles.
3. Water cooled trays are not required.
4. It sets faster than the regular agar technique.

DUPLICATING MATERIALS

Both types of hydrocolloids are used in the dental laboratory

to duplicate dental casts or models for the construction of prosthetic appliances and orthodontic models.

Agar hydrocolloid is **more popular** in the lab because it can be used many times.

In addition, with intermittent stirring, agar hydrocolloid can be kept in a **liquid form for 1 or 2 weeks** at a constant pouring temperature.

These factors make the cost of reversible impression materials quite reasonable.

The hydrocolloid-type duplicating materials have the same composition as the impression materials but their water content is higher.

Cast duplication

After the introduction of alginate, agar slowly lost its appeal as an impression material.

However, it is still popular today as a duplicating material primarily because

- When **liquefied it flows readily**, (like a fluid) over the cast to be duplicated.

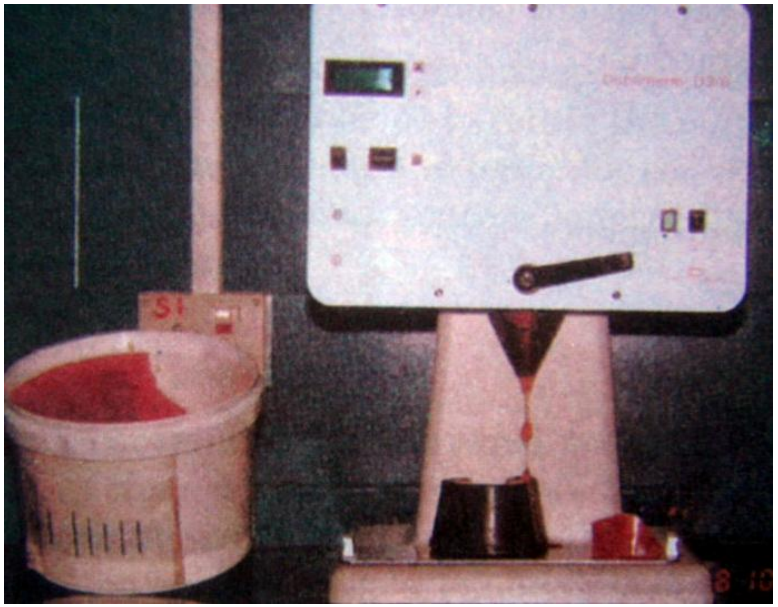
This makes it an ideal mould material.

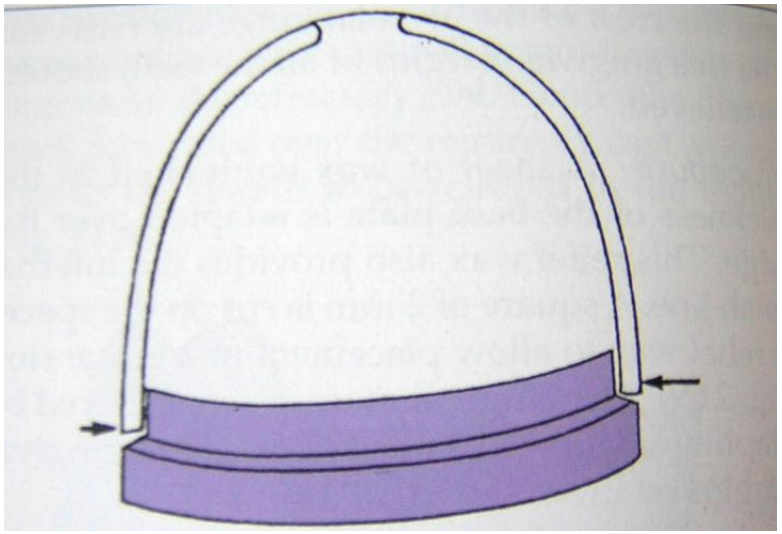
- **Large quantities** can be prepared relatively easily.
- It is **economical** because it can be **reused**.

The agar is broken into small chunks and loaded into the liquefying machine where it is liquefied and stored.

The liquid agar is poured into a mould former in order to create a mould.

Later, investment is poured into this to create a refractory cast which is used in the fabrication of the **cast partial denture framework**.



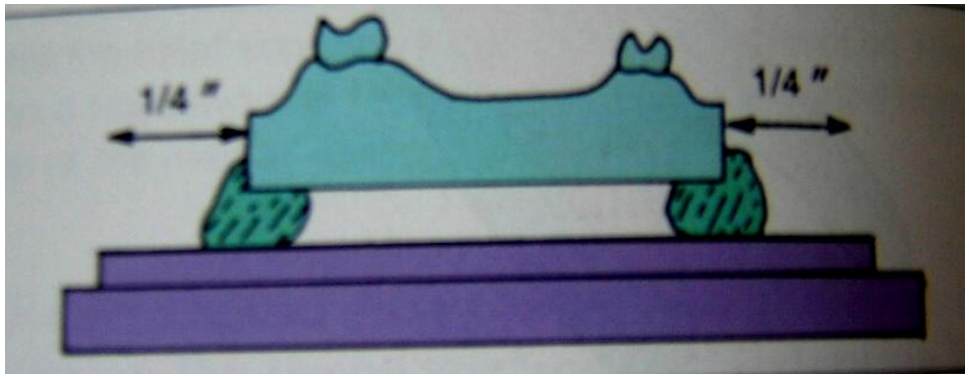


Duplicating flask. Notice the flange of the dome sleeving over the base.

the **duplicating flask** has two parts namely, the **body** and a **reservoir ring or counter**.

The body forms the base of the flask where the cast to be duplicated is positioned.

The resevoir ring is a **dome shaped** structure with vent **holes** through which the duplicating material can be poured in .



The master cast should be positioned using modelling clay.

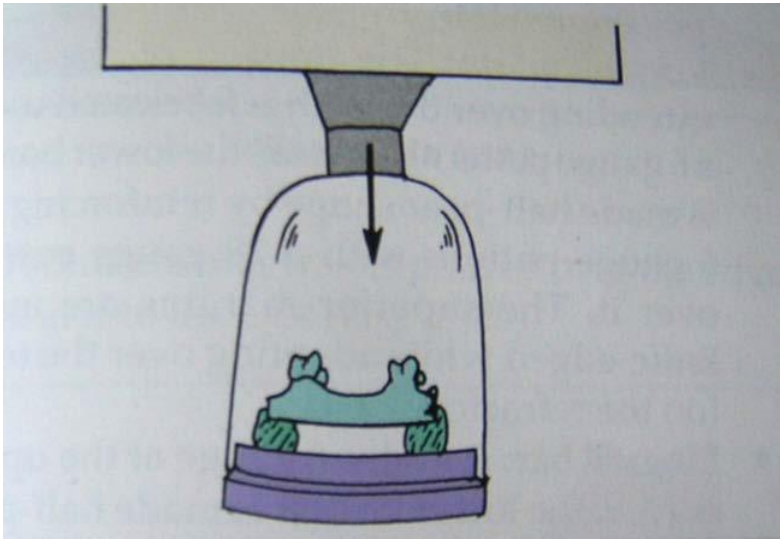
procedure

1. The master **cast should be soaked** in **slurry water** for at **least 5 minutes**

2.The soaked cast is positioned on the base of the duplicating flask such that there

is at **least 1/4th inch clearance all around the cast**

3. The cast is secured in place on the base of the duplicating flask with the help of modelling clay.

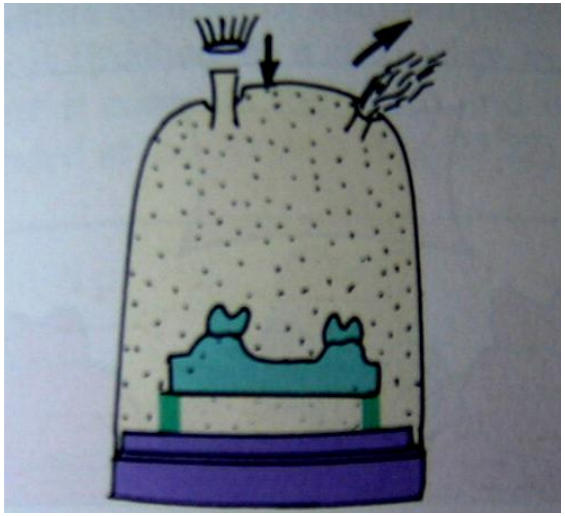


Duplicating material can be filled by aligning the nozzle with the holes of the flask.

4. The reservoir ring is positioned to fit in the body of flask

5.The duplicating flask with the positioned cast is placed in the duplicating unit.

The vent holes of the flask should be aligned below the dispensing nozzle of the duplicating unit.

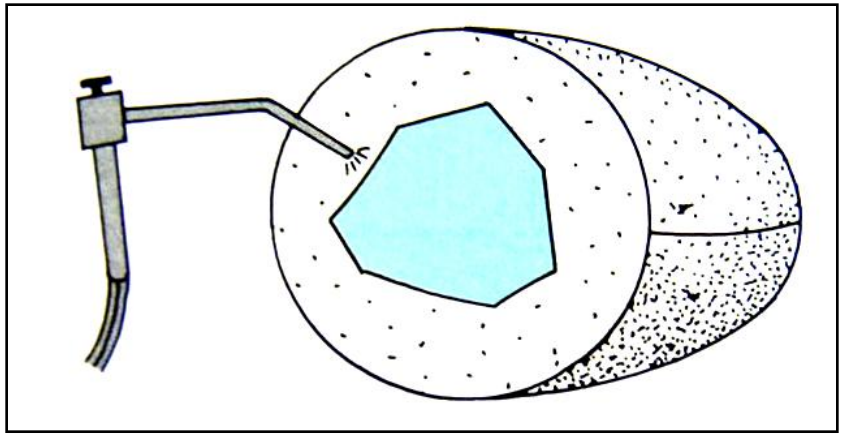


Material is filled till it escapes out through the other vent holes

6. The nozzle is opened till the agar from the storage unit fills the entire reservoir ring of the flask.

When the agar completely fills the reservoir ring it will flow out through the other Vents present in it
7.vacuum is created at this stage when a vacuum based unit is used

8. The agar is allowed to **cool in the duplicating unit with the help of the fan** placed Below the perforated table holding the flask in the unit.

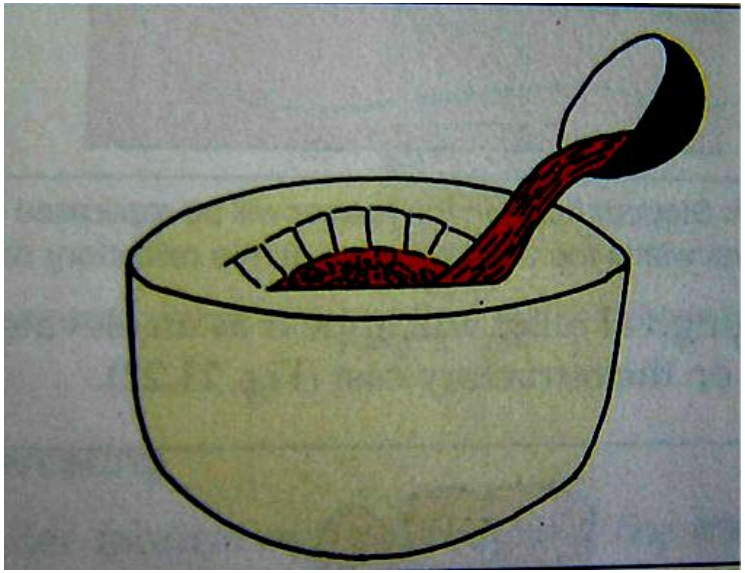


After the agar cools, the master cast can be separated by applying a jet of air spray

9. After the agar cools, the base of the duplicating cast is gently removed. The clay Used for stabilization is removed.

10. A jet of cold air can be blown at the junction of the cast for the set duplicating

Material to loosen and remove the cast embedded in the duplicating madium.



Refractory cast poured using Refractory material.

11. Refractory investment (used to make the refractory cast) is poured into the

Impression of the master cast present in the duplicating material.

The cast is Dried in an oven and treated.

Fabricating the wax pattern for the framework.

Investing is defined as, “ the process
Of covering or enveloping, wholly or in
Part, an object such as a denture, tooth,
Wax form, crown, etc, with a suitable
Investment material before processing,
Soldering or casting”

Advantages

1. **Accurate dies** can be prepared, if the material is properly handled.
2. It has **good elastic** properties and reproduces most **undercut** areas correctly.
3. It has good **recovery from distortion**.
4. As it is not hydrophobic, it gives good model **surface**.
5. It is palatable and well tolerated by the **patient**.
6. It is **cheap** as compared to synthetic elastic materials.
7. It can be **reused** when used as a **duplicating** material (reuse is not recommended when used as impression material).

Disadvantages

1. Does **not flow well** when compared to newly available materials.
2. During insertion or **gelation** it may be **painful** to the patient.
3. **Tears relatively easily**. Greater gingival retraction is required for providing adequate thickness of the material.
4. Only **one model** can be poured.
5. Extensive and **expensive equipment** is required.
6. A soft surface of the gypsum cast results unless a **plaster hardener** is used.
7. Although it can be reused, it is **impossible to sterilize** this material.

THANK YOU

FOR LISTINING