Impression materials are used to register the form and relationship of teeth and surrounding tissues. An understanding of each material's physical characteristics and limitations is crucial for the proper use in clinical dentistr

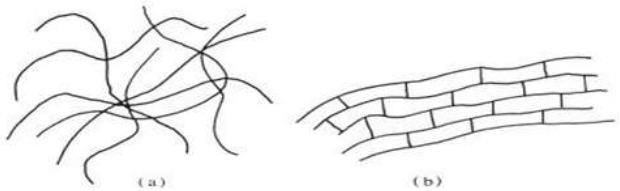
Dental Materials

IMPRESSION MATERIALS

Dr.Azhar Alawadi

Colloids can exist in the form of viscous liquid known as a sol, or a jelly like elastic semi solid described as a gel. If the particles are suspended in water, the suspension is called hydrocolloid. Hydrocolloid impression materials are based on the colloidal suspension of polysaccharide in water. The colloid can exist in two forms; viscous liquid known as **sol** or solid form known as **gel**. **In sol form** there is random arrangement of polysaccharide chain (a) . **In gel form** the polysaccharide chain becomes aligned & the material becomes viscous & develop elastic properties (b) as seen in the figure below.

Gelation: it is conversion of sol to gel.



Hydrocolloids can be subdivided according to setting reaction into:

a. Reversible hydrocolloids: can reliquify from gel to sol. e.g. agar.
b. Irreversible hydrocolloids: once fully converted from sol to gel it cannot be converted back to a sol state e.g. alginate.

Agar impression material:

Agar is **hydrophilic** , **physical reaction & mucostatic Hydrocolloids** . it is Supplied as gel in plastic tubes or bulk containers.

:Manipulation of agar

Patient tolerance to alginate is better than to agar material. Agar should be heated to (70-100º c) in a special container, then cooled to (46ºC) to be loaded to the tray and inserted in the patient's mouth then cooled to (30º C) and then removed. To do such complex manipulation, Agar hydrocolloid requires special equipment which are Hydrocolloid conditioner and Water cooled rim lock tray.

a- Hydrocolloid conditioner

Specially designed conditioning bath (Temperature controlled water bath) consist of three chambers; each holds at different temperature which are:

1- Boiling section (liquefaction section)

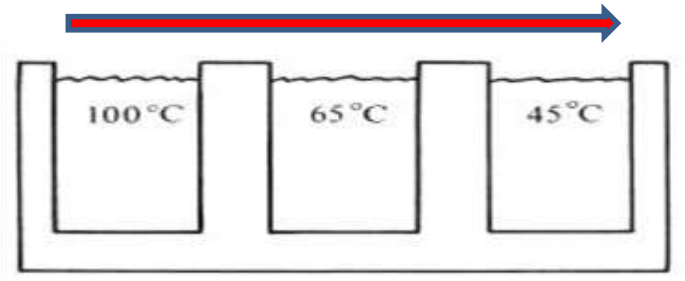
Water bath at (100ºc) for 10 minutes, agar should not be reheated more than 4 times. The tube of agar is placed in this chamber for 1 minutes.

2- Storage section

Water bath at (65-68º c) when agar can be stored in the sol condition till needed.

3- Tempering section

Water bath at (46º c) to reduce the temperature so that it can be tolerated by the sensitive oral tissue (inside patient's mouth) .It also make the material viscous.



b- Water cooled rim lock tray:

Rim-lock tray with Water circulated at (18 to 21º c) through the tray to accelerate setting of agar as seen in the picture below.

Hysteresis: is the use of one temperature for softening and a much lower temp for hardening.

Properties:

1. Provides very accurate reproduction of surface details because in sol form agar is fluid.
2. Poor dimensional stability because of syneresis (water loss from the colloid leading to shrinkage) and imbibitions (water absorption from the surrounding leading to increase in volume of the impression). Should be poured with gypsum immediately but if you can't, wrap the impression with wet towel to reduce dimensional changes.
3. Low tear resistance but it is better than alginate.
4. Removed by a rapid snap action to reduces the permanent deformation.
5. disinfection is the major problem when agar is reused.
6. It is cheap & used in some laboratories for making duplicate models as it can be recycled up to four times.

Alginate impression material:

Alginate is Hydrophilic, chemical setting and mucostatic Hydrocolloids. It is most widely used impression materials in dentistry. Supplied as a powder mixed with water.

Setting reaction

When the powder & water are mixed, a chemical reaction occurs transforming the sol into get.

Sol → (chemical reaction) gel

Mixing:

Either one scoop of powder for one measure of water or equal parts of powder and water in weight is used. Rubber bowl & spatula are used for mixing; spatulation should be rapid & the final mix should be smooth, creamy with minimum voids. Under mixing results in grainy mixture and poor record of details.

Higher powder to water ratio will increase the strength of the final mix. Setting is checked by loss of surface tackiness.

Casting the models:

Impression should be washed with water to remove saliva, excess water is removed then poured immediately, if not the impression should covered with a damp piece of cotton.

If too much water covers the impression, the gel will absorb water and swell because of ***imbibitions***. (absorption of the liquid on the surface of the gel)

If the Impression is left on the bench, it will lose water and shrink because of ***syneresis*** (exudation of the liquid on the surface of the gel).

Properties:

1. Alginate has well controlled working time but it varies from product to product depending on manufacturer instruction. There is regular setting (2-4.5 minutes) & fast setting (1-2 minutes). To increase setting time, mixing with cold water is used. Also high water to powder ratio will increase setting time.

2. Clinical setting time could be detected by loss of surface tackiness.
3. The impression should be left in the mouth for (2-3) minutes after initial set to allow for the development of additional strength . when we remove the tray from patient's mouth, we should avoid rocking movement because it will cause distortion and tearing for the material. So removal should be done with one quick movement.
4. Poor dimensional stability because of syneresis (loss of water loss from the colloid leading to shrinkage) & imbibition (water absorption from the surrounding leading to increase in volume of the impression) , therefore the cast should be poured immediately.
5. Does not adhere to the tray; so the alginate material can be used with perforated or rim-lock stock tray.
6. The cast should not remain in contact with the alginate impression for period of hours because contact of set gypsum with alginate will affect surface quality of the cast.
7. Thin layers of alginate are weak. The thickness of alginate impression between the tray & tissue should be at least 3mm.
8. Record fine details adequately, but not as good as that with agar or Elastomers.
9. Low cost, very easy to be used and pleasant tasting.

Rim lock trays

Perforated trays.

Perforated trays