DENTURE BASE MATERIALS

(ACRYLIC RESINS)

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Q.1 What are DENTURE BASE RESINS ?

- Denture base is defined as that part of denture that rests on the foundation tissue & to which teeth are attached.

- Denture base material is any substance of which denture base may be made.

Q.2 Classify Denture Base Resins.

- Denture base resins are classified in 3 ways……

1. Denture Base Materials

Non-Metallic

Eg. Acrylic resin

Vinyl resins

Metallic

Eg. Cobalt chromium

Gold alloys

Stainless steel

2 .Denture Base Materials

Temporary

Eg. Self cure

- Shellac base plate
- Base plate wax
- Injection molded resins
- Metallic bases

Permanent

Eg. Heat cure denture resins

- Light cured resins
- Pour type resins

3. ANSI/ADA Classification(Sp.No.12/ISO 1567)

- Type 1-Heat polymerizable polymers
  - Class 1-Powder & liquid
  - Class 2-Plastic cake
- Type 2-Autopolymerizable polymers
  - Class 1-Powder & liquid
  - Class 2-Powder & liquid pour-type resins
- Type 3-Thermoplastic blank or powder
- Type 4-Light activated materials
- Type 5-Microwave-cured materials

Q.3 Give Ideal Requirements of DENTAL RESINS.

Dental Resins should:

- Be tasteless,odorless,nontoxic & non-irritant to the oral tissues
- Be esthetically satisfactory,i.e.,should be transparent or translucent
- Be dimensionally stable
- Be insoluble & impermeable to oral fluids
- Have a low specific gravity
- Be economical.

Q.4 Give uses of resins in dentistry.

- Fabrication dentures
- Artificial teeth
- Tooth restoration, e.g.,fillings,inlays & laminates
- Inlay & post-core patterns
- Models
- Splints & stents
- Custom impression trays

Q.5 What is POLYMER?

- A polymer is large & often complex macromolecule that is made from smaller molecules.A macromolecule is any chemical processing a molecular weight greater than 5000.

Q.6 What is MONOMER?

- The molecules from which the polymer is constructed are called MONOMERS.

Q.7 What is CO-POLYMERS?

- Polymer molecules may be prepared from a mixture of different types of monomers & thely are called CO-POLYMERS.

Q.8 What is the molecular weight for various denture polymers & of the cross-linked resins?

- The average molecular weight for various denture polymer range from 8000 to 39,000.

- Cross linked resin teeth may have in excess of 6,00,000.

Q.9 What do you mean by degree of polymerization?

- It is defined as-

  total number of mers in a polymer.

- The higher the molecular weight of the polymer made from a single monomer,the higher the degree of polymerization.
- The strength of the resin increases with increase in the degree of polymerization until a certain molecular weight is reached.

Q.10 Give the physical structure of polymer molecule.

- Three basic structures:

1)Linear
-Homopolymer
-Random copolymer
-Block copolymer

2)Branched
-Branched homopolymer
-Branched random
-Branched graft

3)Cross linked polymer

Q.11 What is POLYMERIZATION?

- The term polymerization refers to a series of chain reactions by which a macromolecule or polymer is formed from a group of smaller single molecules known as ‘monomer’.

Polymer+Monomer+Heat → Polymer +Heat

(powder) (liquid)

Q.12 Name the types of Polymerization.

- Addition Polymerization
- Condensation Polymerization

Q.13 What is Condensation Polymerization?

- Condensation resins are divided into two groups:

-Those in which polymerization is accompanied by repeated elimination of small molecules

-Those in which functional groups are repeated in the polymer chains.The mers are joined by functional groups.

Q.14 What is Addition Polymerization?

- Most of the resins are produced by addition polymerization.There is no change in chemical composition & no by products are formed.The structure of monomer is repeated many times in the polymer.

Q.15 What are physical & chemical stages of polymerization?

- Physical stages :-
  - Wet sand stage
  - Sticky stage
  - Dough stage
  - Rubbery stage
  - Stiff stage

- Chemical stage :-
  - Induction
  - Propagation
  - Termination
  - Chain transfer

Q.16 How does inhibition of polymerization take place?

- The reaction of polymarization are inhibited by
- Impurities:-Impurities react with the activated initiator or any activated nucleus or with an activated growing chain to prevent further growth. e.g hydroquinone.

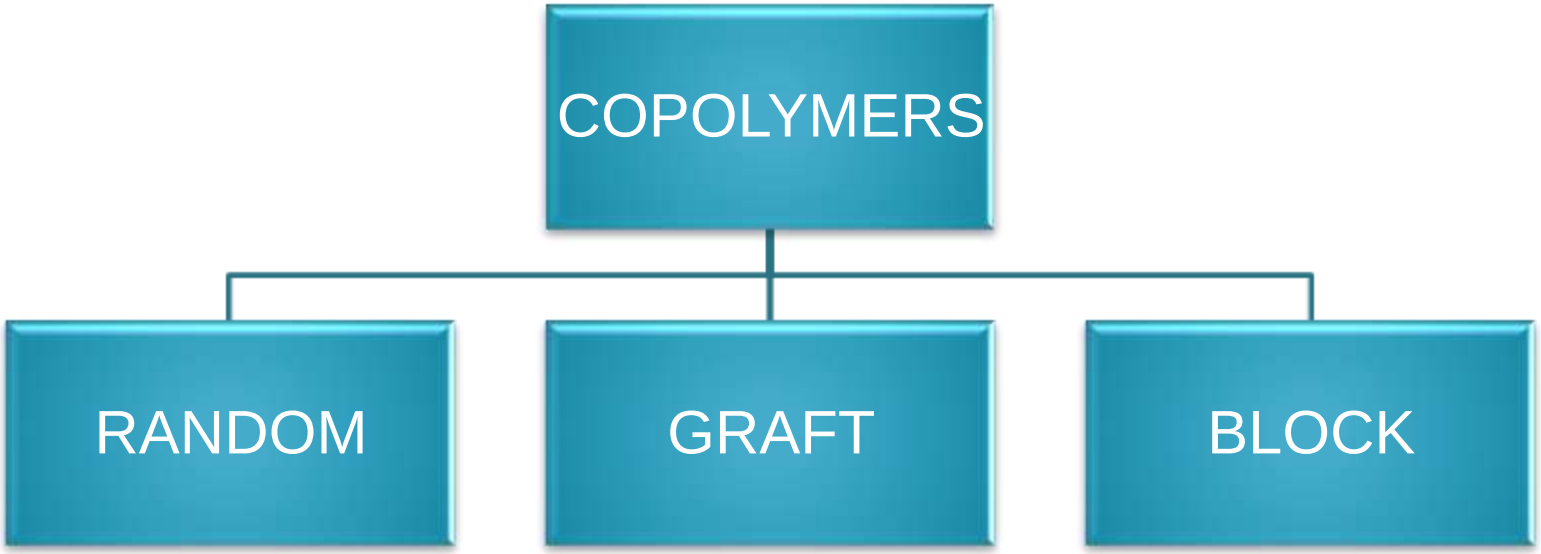
  It is added to prevent polymerization of the monomer during storage.

- Oxygen:-Presence of oxygen also inhibit polymerization.

Q.17 What is CO-POLYMERIZATION?

- The macromolecule may be formed by polymerization of a single type of structural unit.However,in order to improve the physical properties,it is often advantageous to use two or more chemically different monomers as starting materials.The polymers thus formed may contain units of these monomers .Such a polymer is called a copolymer & its process of formation is known as CO-POLYMERIZATION.

Q.18 Give types of copolymers.



Q.19 What is importance of copolymerization?

- Copolymerization is used to improve the physical properties of resin.

- Small amounts of ethyl acrylate may be copolymerized with methyl methacrylate to alter the flexibility.

Q.20 What is CROSS-LINKING?Give its applications.

- The formation of chemical bonds or bridges between the polymer chains is reffered to as cross-linking.It forms a three-dimensional network.

- APPLICATIONS:

1.The more recent acrylic resins are of cross-linked variety.Cross-linking increases rigidity & decreases solubility & water sorption.

2.Acrylic teeth are highly cross-linked to improve its resistance to solvents,crazing & surface stresses.

Q.21 What are PLASTICIZERS? Give its types.

- Plasticizers are the substance added to resins to increase the solubility of the polymer in the monomer,to decrease the brittleness of polymers.

- Two types: external & internal

Q.22 Give composition of heat cure acrylic resin.

LIQUID	
Methyl methacrylate	Plasticizes the polymer
Dibutyl phthalate	Plasticizer
Glycol dimethacrylate	Cross-linking agent
Hydroquinone	Inhibitor

POWDER

Poly(methyl methacrylate)	Major component
Ethyl or butyl methacrylate	Copolymers-improves properties
Benzoyl peroxide	Initiator
Compounds of mercuric sulfide,cadmium sulfide,etc.	Dyes
Zinc or titanium oxide	Opacifiers
Dibutyl phthalate	Plasticizer
Inorganic fillers like glass fibers,zirconium silicate,alumina,etc.	Improves physical properties like stiffness etc.
Dyed synthetic nylon or acrylic fibers	To simulate small capillaries

Q.23 Give composition of self cure acrylic resin.

LIQUID	
Methyl methacrylate monomer	Dissolves/plasticizes polymer
Dimethyl-p-toluidine	Activator
Dibutyl phthalate	Plasticizer
Glycol dimethacrylate	Cross linking agent
Hydroquinone	Inhibitor

POWDER

Poly(methyl methacrylate)& other copolymers	Dissolved by monomer to form dough
Benzoyl peroxide	Initiator
Compounds of mercuric sulfide,cadmium sulfide	Dyes
Zinc or titanium oxide	Opacifiers
Dibutyl phthalate	Plasticizer
Dyed organic fillers & inorganic particles like glass fibers or beads	Esthetics

Q.24 Give difference between heat cure & self cure acrylic resin.

Self cure	Heat cure
-Heat is not necessary for polymerization	-Heat is necessary for polymerization
-Porosity is greater	-Porosity of material is less
-Has lower average mol.wt.	-Higher molecular weights
-Higher residual monomer content	-Lower residual monomer content
-Material is not,strong (because of their lower molecular weights)	-Material is strong
-Rheologogical properties -Shows greater distortion -More initial deformation -Increased creep & slow recovery	-Shows less distortion -Less initial deformation -Less creep & quicker recovery
-Poor color stability	-Color stability is good
-Easy to deflask	-Difficult to deflask Increased rate of monomer diffusion at higher temperature

Q.1 What are the steps of compression molding technique?

- Preparation of the waxed denture pattern
- Preparation of the split mold
- Application of separating medium
- Mixing of powder and liquid
- Packing
- Curing
- Cooling
- Divesting, finishing and polishing

Q.2 From which wax wax pattern is prepared?

- Blue inlay wax

Q.3 Why is application of separation medium necessary?

- To prevent water from the mold entering into the acrylic resin. This may affect the rate of polymerization and color. It can also result in crazing.
- To prevent monomer penetrating into the mole material, causing plaster to adhere to the acrylic resin and producing to the rough surface.
- Help in easier retrieval of the denture from the mold.

Q.4 Type of separating media?

- Tinfoil
- Cellulose lacquers
- Solution of alginate compounds
- Calcium oleate
- soft soaps
- Sodium silicate
- Starches

Q.5 Why is tin foil not used as a separating media now a days?

- Because manipulation is time consuming & difficult.So it is replaced by other separating media.

Q.6 Composition of Sodium Alginate?

- 2% Sodium Alginate in water
- Glycerine
- Alcohol
- Sodium Phosphate &
- Preservatives

Q.7 Setting reaction of sodium alginate?

- It reacts with the calcium of the plaster or stone to form of insoluble calcium alginate.

Q.8 What precaution should be taken while applying separating media?

- Waxes or oils remaining on the mold surface will interfere with the action of the separating medium.
- Mold should be warm,not hot continuity of the film will break if the mold is steaming hot.
- Avoid coating the teeth as it will prevent bonding of teeth with denture base.

Q.9 Powder & liquid ratio of monomer & polymer?

- Polymer-Monomer proportion=3:1 by volume or 2:1 by weight.

Q.10 What happens if too much monomer is used?

- There will be greater curing or polymerization shrinkage.
- More time is needed to reach the packing consitency.
- Porosity can occur in the denture.

Q.11 What happens if too little monomer is used?

- Not all the polymer beads will be wetted by monomer & the cured acrylic will be granular.
- Dough will be difficult to manage & if may not fuse into a continuous unit of plastic during processing.

Q.12 Which instrument is used for trial closure?

- Hydrolic or Mechanical press

Q.13 What is FLASH?

- The excess dough,found during trial closure is known as FLASH.

Q.14 What is the purpose of Bench Curing?

- Permits an equalization of pressures throughout the mold.
- It allows time for a more uniform dispertion of monomer throughout the mass of dough,since the lateral material added is usually drier than the first added to the flask.
- It provides a longer exposure of resin teeth to the monomer in the dough,producing a better bond of the teeth with the base material.

Q.15 What is CURING CYCLE? Give temperature of curing cycle.

- Curing Cycle is the technical name for the heating process used to control the initial propagation of polymerization in the denture mold.
- Heat the flask in water at 60-70°c for 9 hours.(long cycle)
- Heat the flask T 65°c for 90 min,then boil for 1 hour for adequate polymeraization of the thinner portion.

Q.16 How Cooling is done?

- The flask should be cooled slowly.

E.g., bench cooled. Fast cooling can result in warpage of the denture due to differential thermal contraction of the resin & gypsum mold.Cooloing overnight is ideal.However,bench cooling it for 30 min & then placing it in cold tap water for 15 min is satisfactory.

Q.17 Advantages of injection molding technique:

- Dimensional accuracy
- No increase in vertical dimension
- Homogeneous denture base
- Good impact strength.

Q.18 Disadvantage of injection molding technique:

- High cost of equipment
- Difficult mold design problems
- Special flask is required.

Q.19 What are the other names of chemically activated denture base resin?

- Self-cure,Cold-cure,Auto-polymerizing resin

Q.20 Uses of chemically activated denture base resin:

- For making temporary crowns & FPDs
- Construction of special trays
- For denture repair,relining & rebasing
- For making removable orthodontic appliances.

Q.21 Advantages & disadvantages of chemically activated denture base resin:

- Better initial fit,which is because the curing is carried out at room temp.Thus there is less thermal contraction.
- Color stability is inferior to that of heat cure resin,due to subsequent oxidation of the tertiary amine.
- Slightly inferior properties because the degree of polymerization of self curing acrylics is less than that of heat cured ones
- For repairing dentures,self curing resins are preferable to heat cured resins as heat curing causes warpage.

Q.22 What techniques are used for manipulation of autopolymerizing resins?

- Sprinkle on technique
- Adapting technique
- Fluid resin technique
- Compression molding technique

Q.23 Composition of light activated denture base resin:

- It consists of a urethane dimethacrylate matrix with an acrylic copolymer,Microfine silica fillers,& a Camphoroquinone-amine photoinitator system.One such product is known as VLC triad.

Q.24 How is light activated denture base resins supplied?

- It is supplied in premixed sheets having a clay like consinstency.It is provided in opaque light tight packages to avoid premature polymerization.

Q.25 How is light activated denture base resin polymerized?

- It is polymerized in a light chamber with blue light of 400-500 nm from high intensity quartz-halogen bulbs.
- The denture is rotated continuously in the chamber to provide uniform exposure to the light source.

Q.1 Mention the processing errors in acrylic resin.

- Porosity
- Crazing
- Denture warpage

Q.2 Give types of porosity.

- Internal porosity
- External porosity

Q.3 What is the cause of internal porosity & How can it be avoided?

- Internal porosity occurs due to vaporization of monomer when the temperature of the resin increases above the boiling point of monomer or very low molecular weight polymers.
- Exothermic heat of the surface resin dissipates easily into the investing plaster.However,in the center of the thick portion the heat can’t be conducted away.
- Therefore,the temperature in the thick portions may rise above the boiling point of monomer causing porosity.

- Avoided by Dentures with excessive thickness should be cured using a long,low temperature curing cycle.

Q.4 Mention the cause of external porosity & How can it be avoided?

- The cause of external porosity:

1)Lack of homogeneity

2)Lack of adequate pressure

- Lack of homogeneity is avoided by using proper powder/liquid ratio & mixing it well.The mix is more homogenous in the dough stage,so packing should be done in the dough stage.

- Lack of adequate pressure is avoided by using the required amount of dough.Check for excess or flash during trail closure.Flash indicates adequate material.

Q.5 What is CRAZING?

- Crazing is formation of surface cracks on the denture base resin. The cracks may be microscopic or macroscopic in size.In some cases it has a hazy or foggy appearance rather than cracks.

Q.6 How porosity will create problems for the patient?

- It makes the appearance of denture base unsightly.
- Proper cleaning of the denture isn’t possible, so the denture hygiene & the oral hygiene suffers.
- It weakens the denture base and the pores are areas of stress concentration, thus the denture warps as the stresses relax.

Q.7 What are the causes of crazing?

- Mechanical stresses.
- Attack by a solvent.
- Incorporation of water.

Q.8 How will you avoid crazing?

- Using cross linked acrylics.
- Tin toil separating medium.
- Metal molds.

Q.9 Define denture warpage?

- Denture warpage is the deformity or change of shape of the denture which can affect the fit of the denture. Warpage can occur during processing as well as at other times.

Q.10 Give types of repair resin?

- Heat lured.
- Self cured.

Q.11 How you will take care of acrylic denture?

- Dentures should be stored in water when not in use, since dimensional changes can occur on dying.
- Acrylic dentures should not be cleaned in hot water , since processing stresses can be released and can result in distortion.
- Abrasive dentifrices should not be used,since the plastic is soft & can be easily scratched & abraded.The tissue surface should be brushed carefully with a soft brush,since any material removed alters the fit of the denture.
- Besides physical brushing various cleaning agents are commercially available.

Q.12 Give composition of denture cleansers.

- Alkaline compounds
- Detergents
- Flavoring agents
- Sodium perborate

Q.13 What are the method use to clean the denture?

- Immersion in an agent
- By brushing with the cleanser

Q.14 Give classification of denture reliners.

- Hard or soft
- Heat cured or self cured
- Short term or long term
- Resin based or silicone based

Q.15 Give types of soft liners.

- Short term soft liners (tissue conditioners)
- Long term soft liners

Q.16 Define tissue conditioners,give its composition.

- Tissue conditioners are soft elastomers used to treat irritated mucosa.

- COMPOSITION:

-These are highly plasticized acrylic resins,supplied as powder & a liquid.

-Powder: poly(ethyl methacrylate) or one of its copolymers.

-Liquid: Aromatic ester(butyl phthalate butyl glycolate) in ethanol or an alcohol of high molecular weight.

Q.17 What are the uses of tissue conditioners?

- ILL-FITTING dentures can cause inflammation & distortion of the oral tissues.
- Relining an ill-fitting denture with tissue conditioner allows the tissue to return to normal at which point a new denture can be made.
- As an impression material.

Q.18 What are denture adhesives? Give its composition.

- They are highly viscous aqueous solutions which are often used to improve the retention of complete dentures.

- COMPOSITION:

-Keraya gum

-Tragacanth

-Sodium carboxy methyl cellulose

-Polyethylene oxide

-Flavoring agents

-Some also contain antimicrobial agents & plasticizers.

Q.19 What are the indication of denture adhesives?

- Temporary retention of poorly fitting dentures.
- Patients having poor neuromuscular control

Q.20 What is the disadvantage of denture adhesives?

- It has an unpleasant feel , is difficult to clean & is diluted easily by saliva.

THE END