Composite Restorations

Composition: Basically, composite restorative materials consist of:

1. organic resin forms the matrix which is dimethacrylate monomer (BIS-GMA)

2. Inorganic filler phase

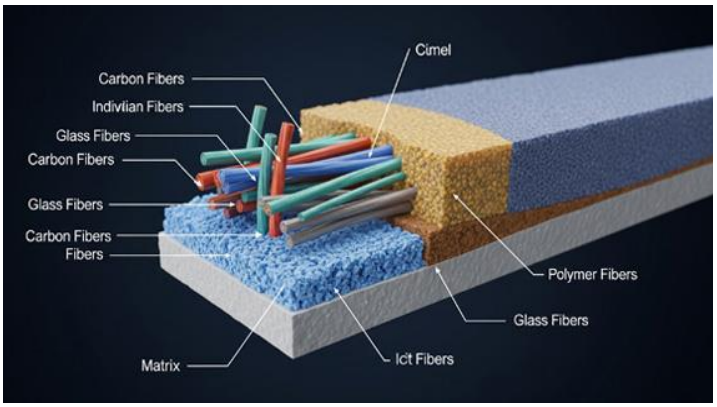
- To improve the physical properties of the composite by increasing the strength of the restorative material and reducing thermal expansion.

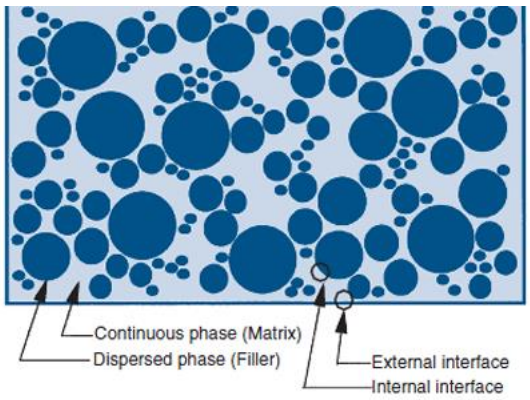
This filler made from silica, quartz, and glass particles.

- Inhibit the deformation of the matric

3. A silane coupling agent:

- units the organic resin matrix and the inorganic filler.
- reduces its solubility and water absorption.

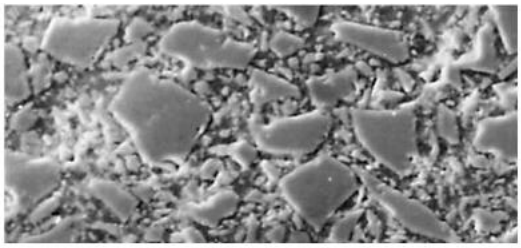




Classification of composite: Composites are usually classified primarily on the basis of the size, amount, and composition of the inorganic filler. Different types of composite used include macrofill composites (also called conventional composites), microfill composites, hybrid composites (including traditional hybrid, microhybrid, and nanohybrid composites), and nanofill composites. Composites also have been classified on the basis of their handling characteristics, for example, **as flowable and packable composites.**

1. Macrofill (or Conventional) Composites

Macrofill composites were the first type of composites introduced in the early 1960s. they are no longer used in clinical practice. Macrofill composites generally contained approximately 75% to 80% inorganic filler by weight. The average particle size of conventional composites was approximately 8 μm.



polished surface of a conventional composite

Because of the large size and extreme hardness of the filler particles:

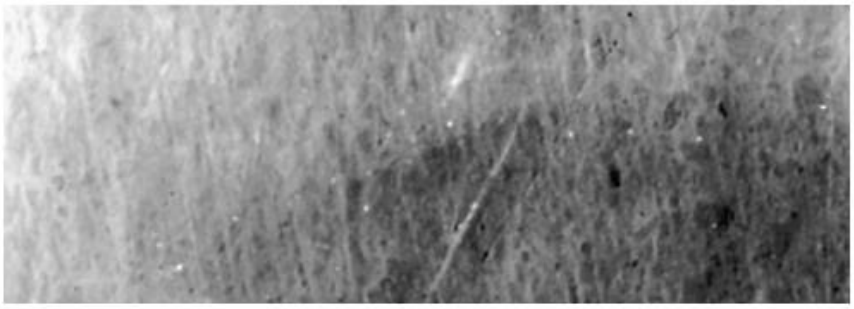
- The resin matrix wears at a faster rate than do the filler particles,
- Roughening the surface causes the restoration to be more susceptible to discoloration from extrinsic staining.
- Have a higher amount of initial wear at occlusal contact areas than do the microfill or hybrid types.

2. Microfill Composites microfill composites contain inorganic fillers whose average diameter is 0.01 to 0.04 μm. and content of approximately 35% to 60% by weight.

- This small particle size results in a smooth, polished surface in the finished restoration that is less retentive to plaque or extrinsic staining.
- Because these materials contain less filler than do conventional or hybrid composites, some of their physical and mechanical characteristics are inferior.
- High resin content results in an increase coefficient of thermal expansion and lower strength.

• Microfill composite restorations flex during tooth flexure, (low modulus of elasticity).

• an appropriate choice for restoring Class V restorations



polished surface of a microfill composite

3. Hybrid Composites

• Combine physical and mechanical properties characteristic of macrofill composites with the smooth surface of the microfill composites.

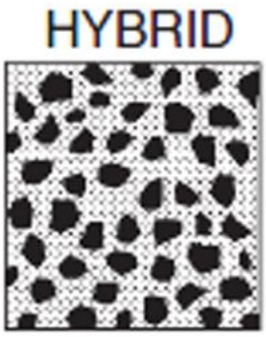
• inorganic filler content of approximately 75% to 85% by weight.

• average particle size (0.4–1 μm)

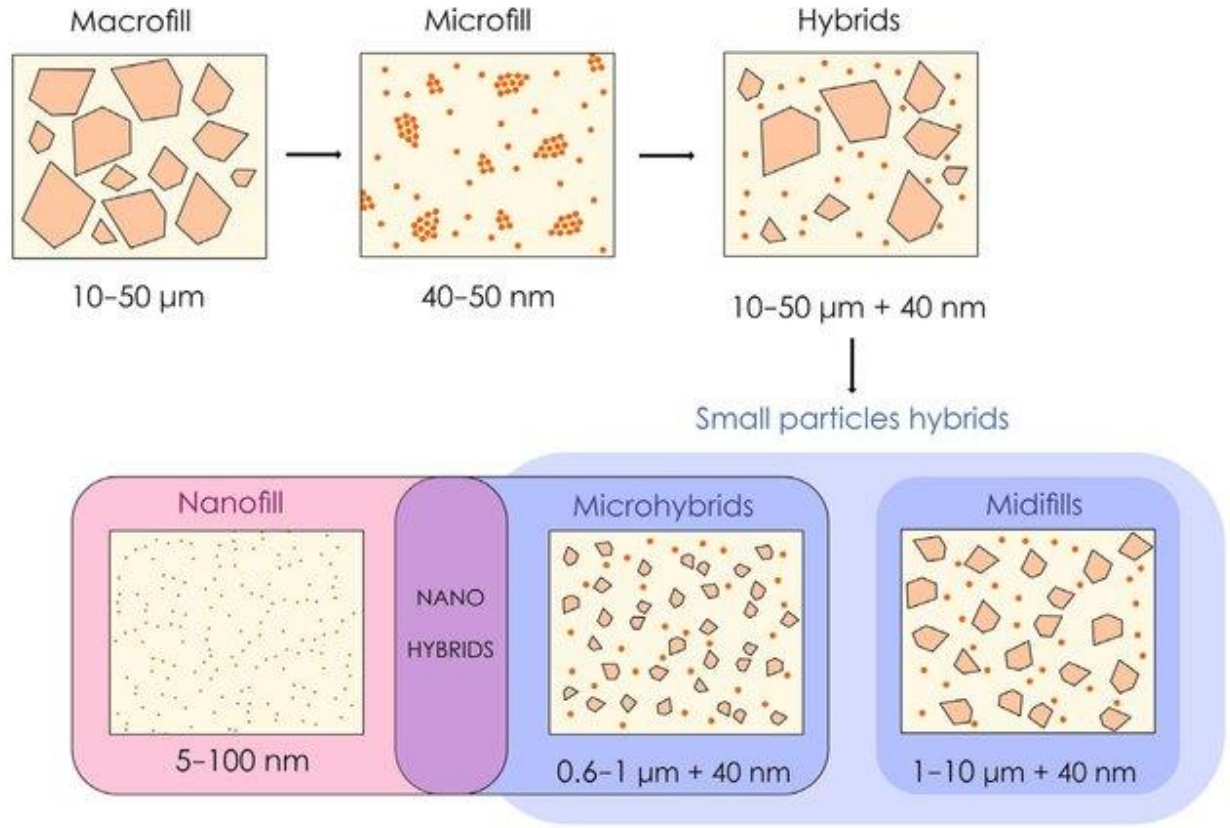
• the physical and mechanical proparties is superior to those of conventional composites..

• Have universal clinical applicability.

• Predomenent direct aesthetic resin



Used in moderates stress restorations where strength and wear resistanceare more important than surface luster. Class I, classII.classIV.



4. Nanofill

- Nanofill composites contain filler particles that are extremely small (0.005–0.01 µm).

- Because these small primary particles can be easily agglomerated, a full range of filler sizes is possible,

- high filler levels can be generated in the restorative material, which results in good physical properties and improved esthetics.

- The small primary particle size also makes nanofills highly polishable.

- Because of these qualities, nanofill and nanohybrid composites are the most popular composite restorative materials in use.

5. Packable Composites

Packable composites are designed to be more viscous to a feel on insertion, similar to that of amalgam.

- Their development is an attempt to accomplish two goals:

(1) easier restoration of a proximal contact .

(2) similarity to the handling properties of amalgam.

- Because of the increased viscosity, more difficult to attain optimal marginal adaptation, prompting some clinicians to first apply a small amount of flowable composite along proximal marginal areas to enhance adaptation.

6. Flowable Composites

Flowable composites generally:

- Have lower filler content
- lower wear resistance and lower strength

compared with the more heavily filled composites.

- They exhibit much higher polymerization shrinkage.
- They seem to be more appropriate for use in

1. Some small Class I restorations,

2. As pit-and-fissure sealants,

3. As marginal repair materials, or,

4. More infrequently, as the first increment placed as a stress-breaking liner under posterior composites.

5. Additionally, flowable composites are being used as first small increments in the proximal box of a Class II restoration in an effort to improve marginal adaptation.

Reinforced composite: it consist of combination of a resin matrix, randomly oriented E glass fiber and inorganic particulate fillers.

Used as base filling material in high stress bearing areas especially in large cavities of vital and non-vital posterior teeth. General Considerations for Composite Restorations

Indications

1. Class I, II, III, IV, V, and VI restorations

2. Foundations or core buildups

3. Sealants and preventive resin restorations (conservative composite restorations)
4. Esthetic enhancement procedures:

- Partial veneers
- Full veneers
- Tooth contour modifications
- Diastema closures

5. Cements (for indirect restorations)

6. Temporary restorations

7. Periodontal splinting

Contraindications

1. If the operating site cannot be isolated from contamination by oral fluids,

2. If all of the occlusion is on the restorative material,

3. Composite restoration extensions on the root surface may exhibit gap formation at the junction of the composite and the root. The use of an RMGI liner beneath the composite in the root-surface area may reduce the potential for microleakage, gap formation, and recurrent caries.

Advantages

1. Esthetic.

2. Conservative in tooth structure removal (less extension, uniform depth not necessary, mechanical retention usually not necessary).

3. Less complex when preparing the tooth.

4. Insulating; having low thermal conductivity

5. Bonded to tooth structure, resulting in good retention, relatively low microleakage, minimal interfacial staining, and increased strength of remaining tooth structure.

6. Repairable.

Disadvantages

1. May have a gap formation, usually occurring on root surfaces as a result of the forces of polymerization shrinkage of the composite material.

2. Are more difficult, time-consuming, and costly (compared with amalgam restorations)

3. Are more technique-sensitive because the operating site must be appropriately isolated, and the placement of etchant, primer, and adhesive on the tooth structure (enamel and dentin).

4. May exhibit greater occlusal wear in areas of high occlusal stress or when all of the tooth's occlusal contacts are on the composite material.

5. Have a higher LCTE (linear coefficient of thermal expansion), resulting in potential marginal percolation if an inadequate bonding technique is used.