



# Adhesive systems

## Etch&rinse and self-etch systems

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# Composites – adhesive filling technique

- ☑ preparation;
- ☑ acid etching/conditioning (enamel, dentin);
- ☑ using adhesives/bonding agents  
(primer + bond) both on enamel, dentin)  
→ minimal invasivity, microretention;
- ☑ composite filling technique.

# Adhesion

the anorganic tooth material changes to  
resin

connection of two materials on one  
interlocking surface

has two phases:

① demineralisation

② hybridisation

# Conditioning – enamel

- ☑ dr. Michael Bouncore, 1967
- ☑ previous phosphoric acid milling + bonding agents → micromechanical gripping

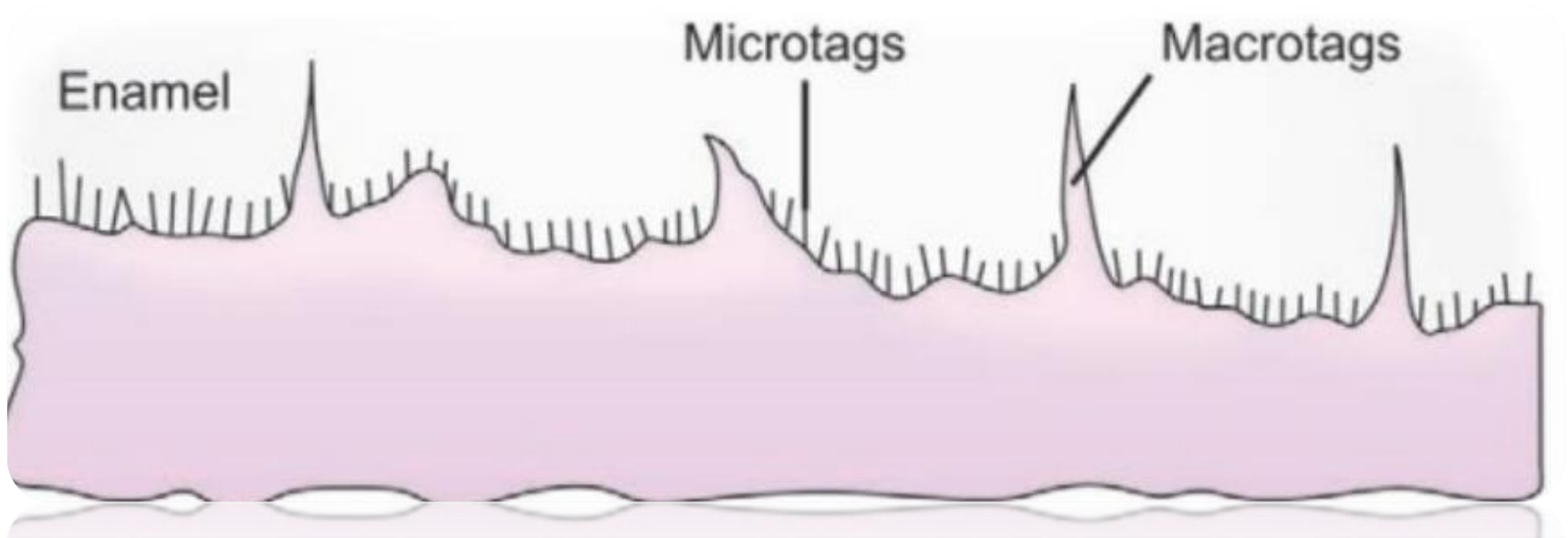
after 30~40s penetration is 10~50  $\mu\text{m}$  deep

microtag:

where the nucleus of the enamel prism dissolves

macrotag:

where the periphery of the enamel prism dissolves



# Conditioning – dentin

more difficult:

- ☑ less hydroxy apatite;
- ☑ inhomogeneous structure.

# Smear layer

- ☑ start up during preparation;
- ☑ 0,5~5  $\mu\text{m}$  organic and anorganic components  
(dentin chips + microorganisms);
- ☑ plugs in the tubuli  
2~5  $\mu\text{m}$  deep →  
obstruct the attachments.

# The „predestination” of smear layer

etch&rinse –  
removes

self~etch –  
modifies



# Adhesives

(primer + bond)

- ☑ basic is similar to the composite matrix (BisGMA);
- ☑ hidrophobe;
- ☑ close the clear dentin surface, so protect from
  - ~ microleakage;
  - ~ postoperative sensitivity;
  - ~ hydrodynamical stimuli;
- ☑ reduce polymerisation shrinkage.

# Primer

- ☑ to interconnect the hydrophilic dentin and the hydrophobic bonding agent;
- ☑ water and infiltrate the collagen network → hybridisation is possible.

# Sorts of primers

- ☑ water based; } ☝ „dry bonding”
- ☑ ethanol based; } ☝ „wet bonding”
- ☑ acetone based.

# Utilization of dentin tubuli for bonding

- ☑ in superficial dentin layers: less tubuli, smaller cross section → intertubular areas are more important;
- ☑ in deeper layers: more tubuli, bigger cross section → intratubular, additional bonding forces.

# Classifications of adhesives

## ① generations I~VII

according to marketing appearances;

## ② Van Meerbeek's subdivision

due to clinical usings:

- ☑ total-etch = etch & rinse systems;

- ☑ self-etch bondings;

- ☑ resin modified glass ionomer bonding systems.

①

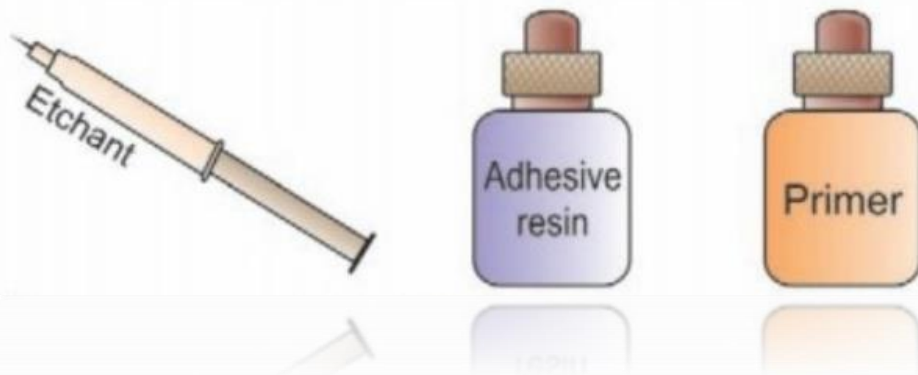
# Etch & rinse systems with the removal of smear layer

3 steps

- ✓ etchant;
- ✓ primer;
- ✓ bond.

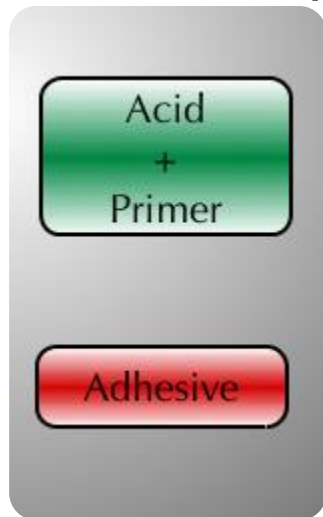
2 steps

- ✓ etchant;
- ✓ primer + bond.



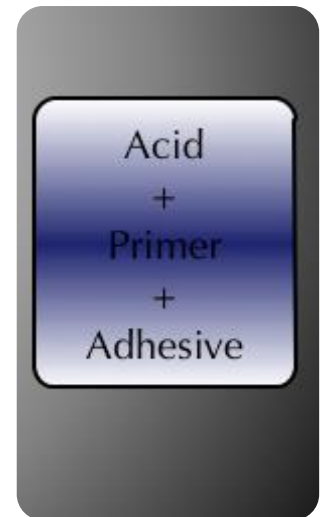
## ② Self-etching systems with modifying the smear layer

- ✓ there's no previous conditioning;
  - ✓ their monomers have acidic groups;
  - ✓ put directly on the smear layer
- built-in the hybrid layer.



2 steps  
←

1 step  
→



# Self-etch adhesives

According to acidic aggressivity:

☒ strong;

☒ mild;

☒ medium strong systems.



# Strong self-etch adhesives

- ☑ pH 1 or less → intensely demineralise;
- ☑ there's no chemical interaction;
- ☑ bonding mechanism based on diffusion;
- ☑ few clinical experiences.

# Mild self-etch adhesives

- ☑ approximately pH2 → demineralisation in 1  $\mu$ m deep;
- ☑ additional chemical bonding;
- ☑ thinner hybrid layer;
- ☑ weak point is bonding to enamel.

# Medium strong self-etch adhesives

- ✓ approximately pH 1,5;
- ✓ „strong effect” in top layers:  
better micromechanical attachment;
- ✓ „mild effect” in deeper layers: chemical bonding.

# ③ Resin modified glass ionomer adhesives

- ☑ filling material with more resin;
- ☑ less postoperative sensitivity (since there's no acid etching + also stress breaking);
- ☑ with polypropylene acid preconditioning even betteradhesion.

# ③ Resin modified glass ionomer adhesives

10~20% polypropylene acid

- ☑ removes smear layer →  
microporosity in the dentin:  
micromechanical attachment;
  - ☑ chemical bonding with calcium ions.
- } „mild self etch”

# Use

- ① 10~20% polypropylene acid etching for 10s  
→ rinsing, drying;
- ② as an underliner.

**Thank you!**