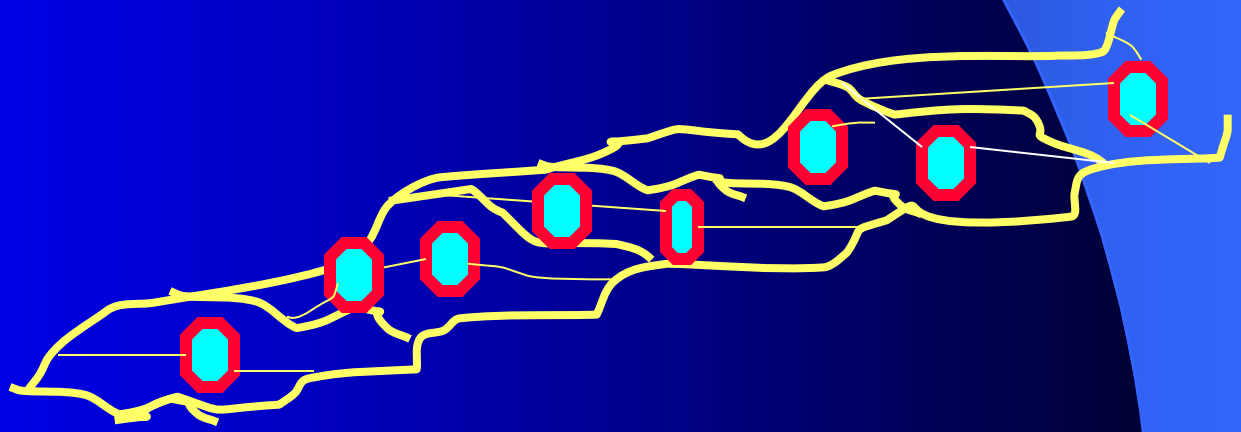
Composites

Chemically bonded mixture of organic matrix and inorganic filler



Composition

- **Organic matrix**

Bowen monomer Bis GMA

UDMA

Oligomer – more flowable (thinning)

TEGMA

Composition

Filler

Milled quartz

Aluminium silicate glass

Silica

Prepolymer

Nanoparticles

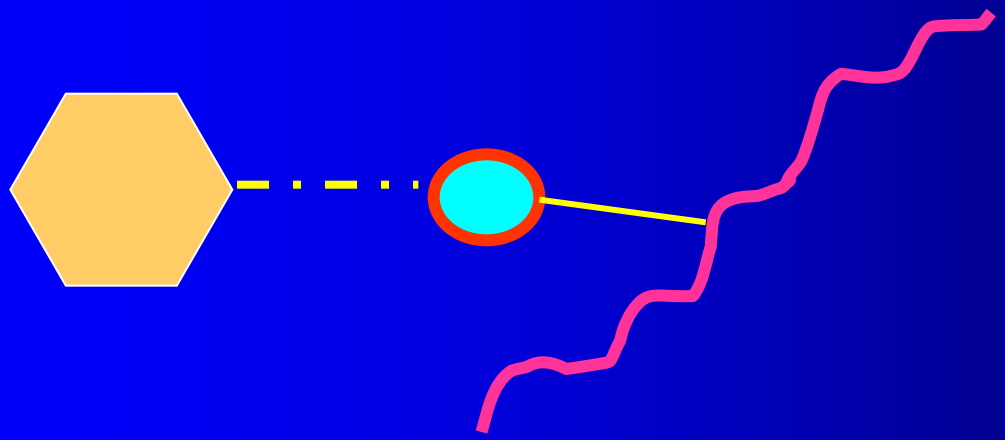
Composition

- **Coupling agent**

Silan

Binding between organic and inorganic part

Homogenous distribution of *filler* in composite



Composition

Iniciators and accelerators

Other components

- Pigments
- UV absorbers

Classification acc.to size of filler particles

Macrofiller composites (size micrometers)

Microfiller composites (size 0,02 -0,04 micrometers)

Homogenous

Non homogenous

Hybride composites (combination of filler)

Classification according to type of fillers

(Philips & Lutz 1984)

Macrofiller

Microfiller
(pyrogenic SiO_2)

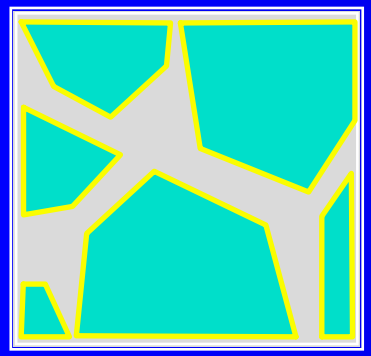
Microfiller-complexes

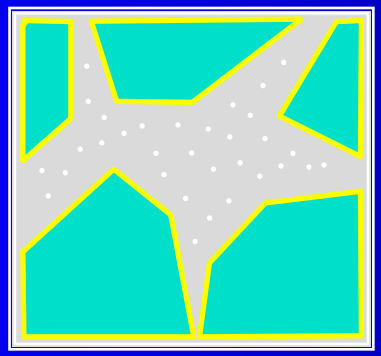
Macrofiller Composite

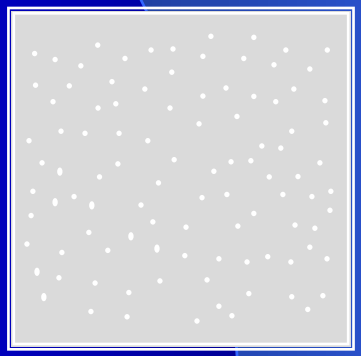
Hybrid Composite

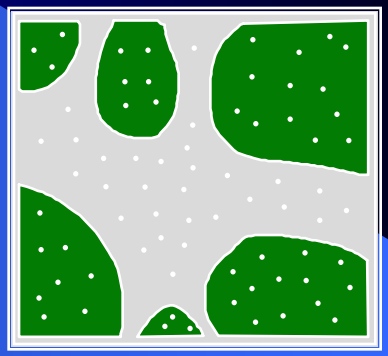
homogenious Microfiller Composite

inhomogenious Microfiller-Composite

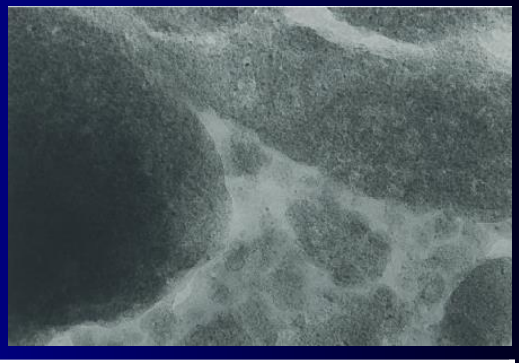






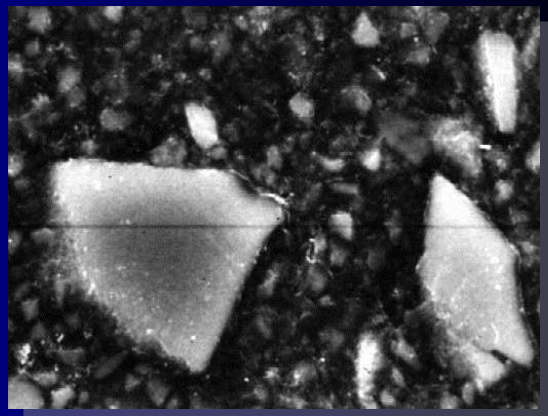


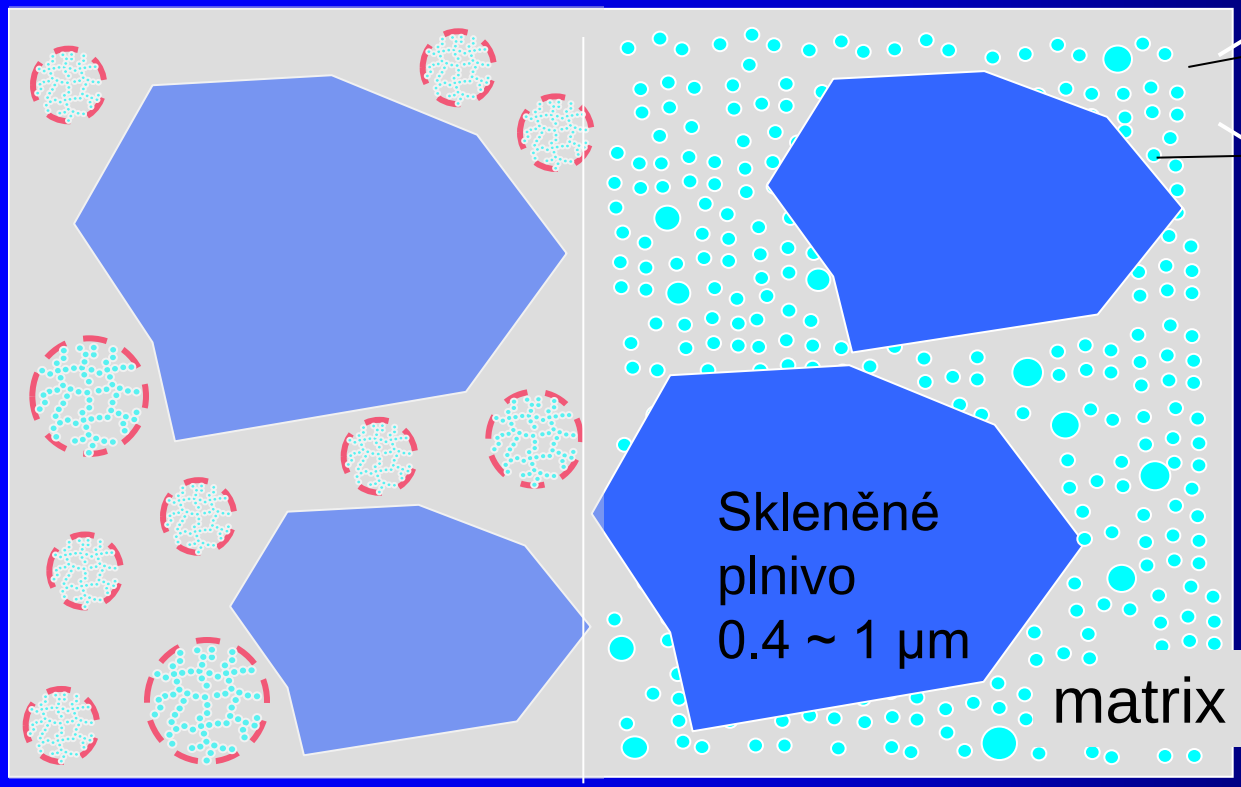
Filler particles

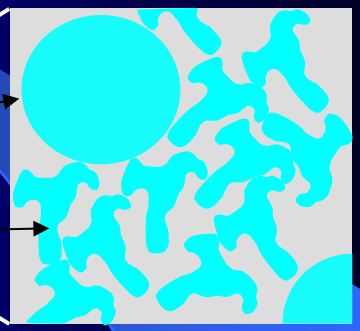


Filler size (medium particle size)	Composite category
< 10 μm	hybrid composite
< 5 μm	fine particle hybrid
< 3 μm	ultrafine particle hybrid
< 1 μm	submicron hybrid , nano composites

Filler - example







More filler
→
Less amount of resin
→
Lower polymerization shrinkage

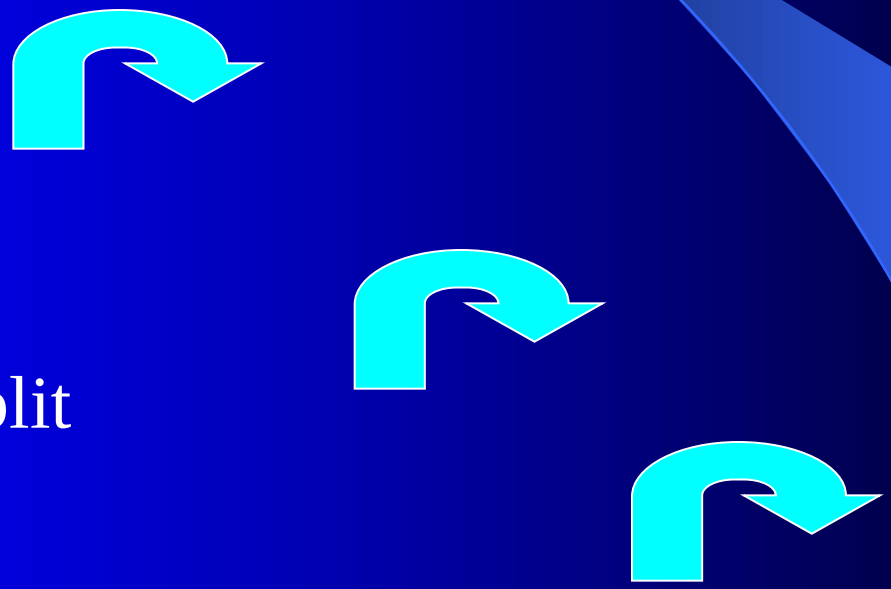
Polymerization reaction

Accelerator

Iniciator

Double bonds – split

Polymer network



Curing

- Light curing composites
- (Light activated).

Light activation is accomplished with blue light (470 nm)

Initiator is camphorquinon

Chemically cured composites

Iniciator is organic peroxide, accelerator tertiary amine

Classification acc to mode of curing

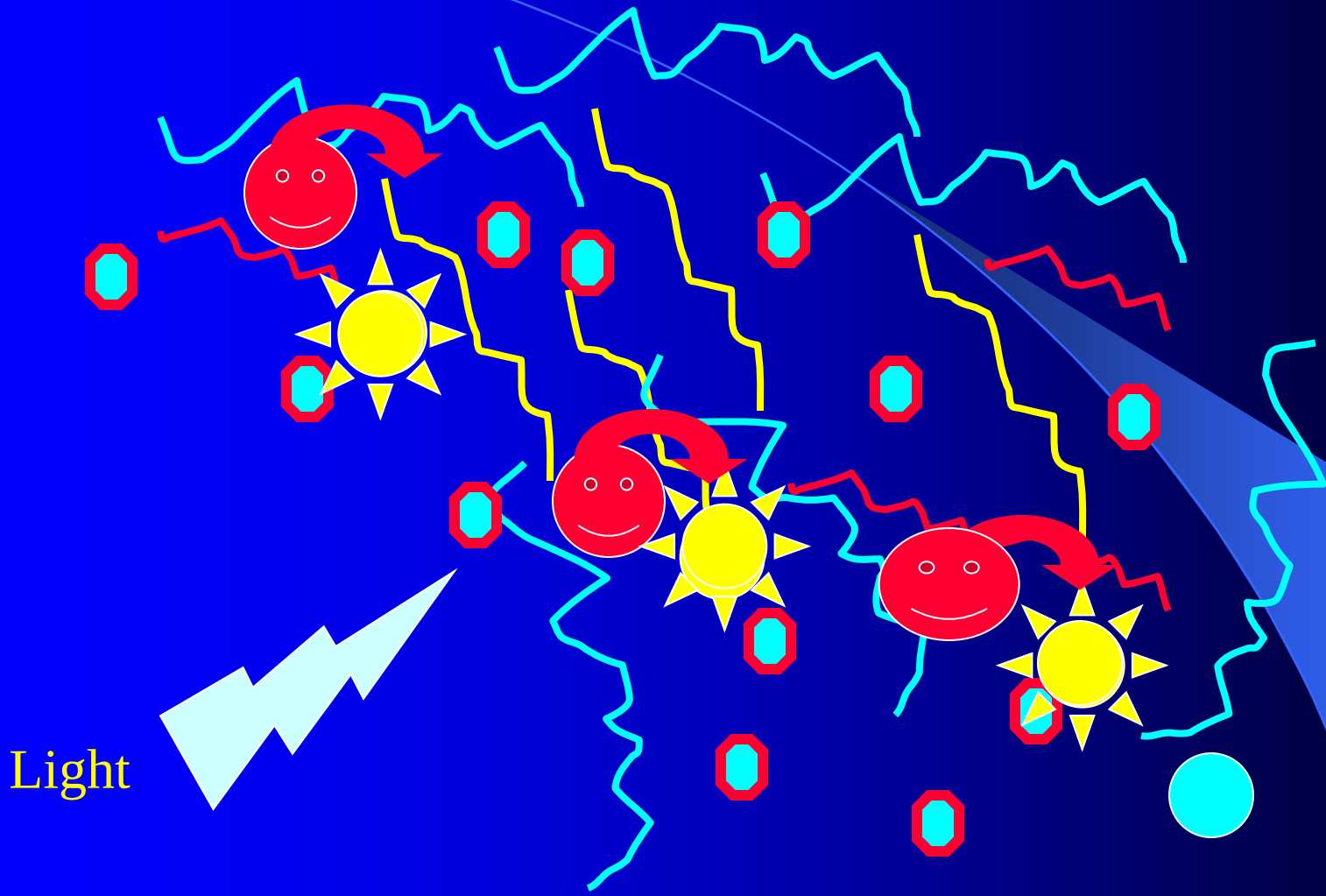
- Light curing
- Self curing (chemically curing)
- Dual curing (cementzs)
- Heat curing (for dental lab)

Polymerization units

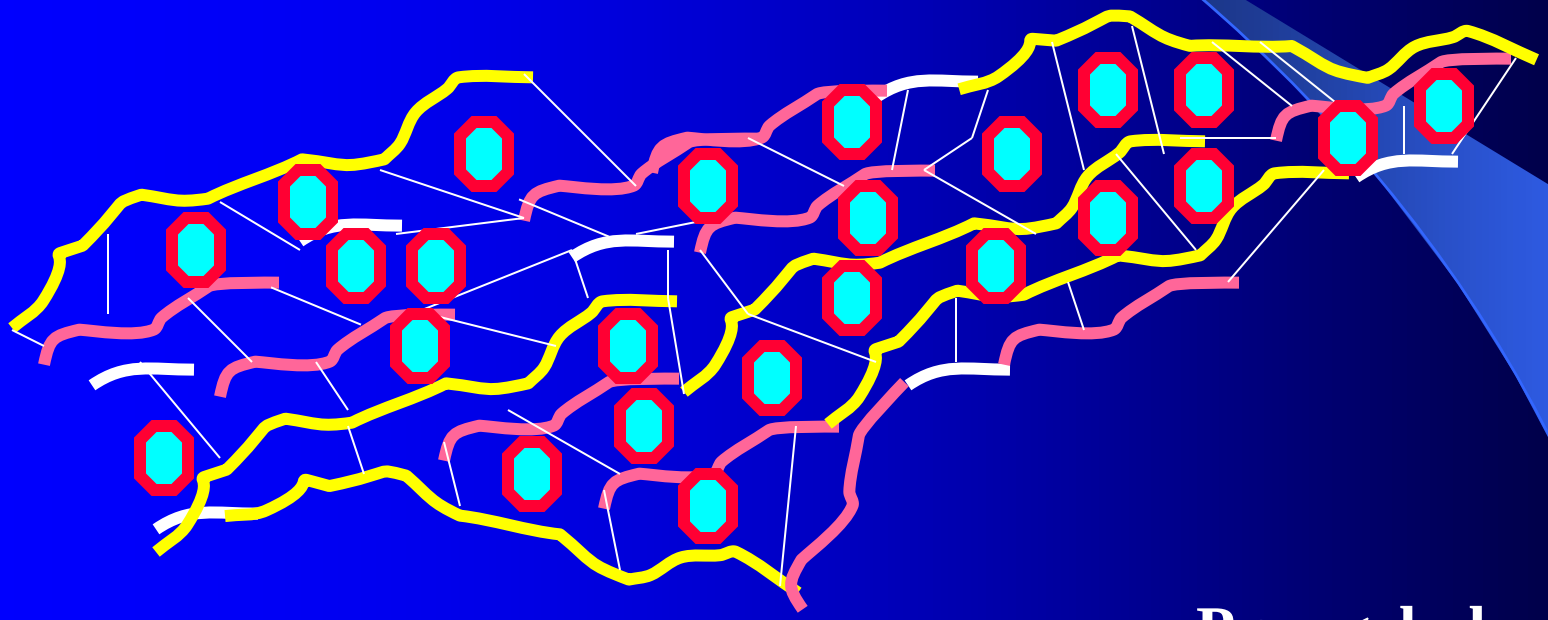
- Quartz halogen units
- LED units

Blue light, 400 – 500 nm.

Camphorchinon 470 nm (maximum absorption)


Light

Polymer network



Polymerization shrinkage

Pre –gel phase
Gel-point
Post –gel phase

Indications

- Frontal area:

Class III., IV, V.

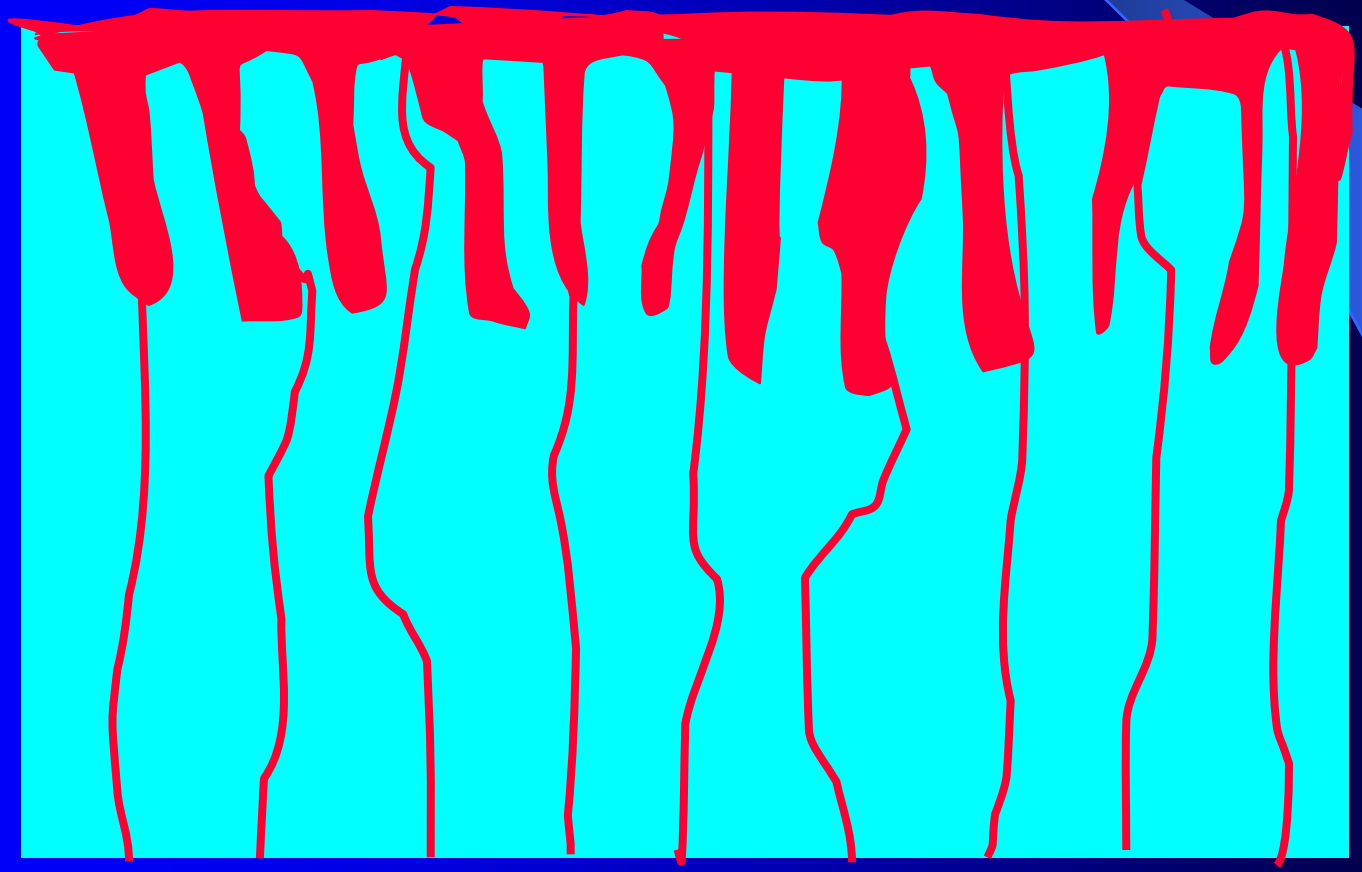
Posterior area

Small – moderate cavities I. and II. class

Contraindications

- Bad level of oral hygiene
- Dry operation field is impossible
- Large cavities I. and II. class

Principle of retention - micromechanical



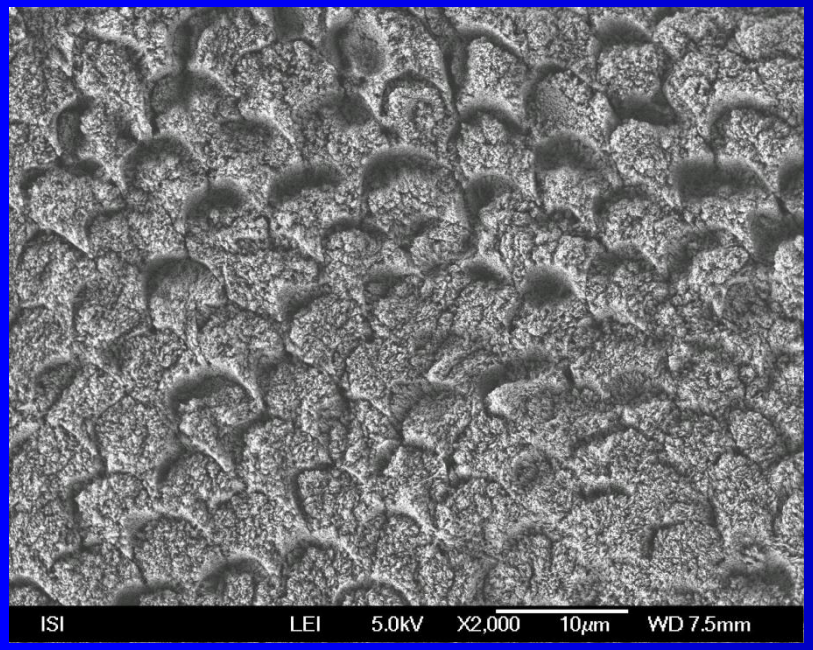
Retention in enamel

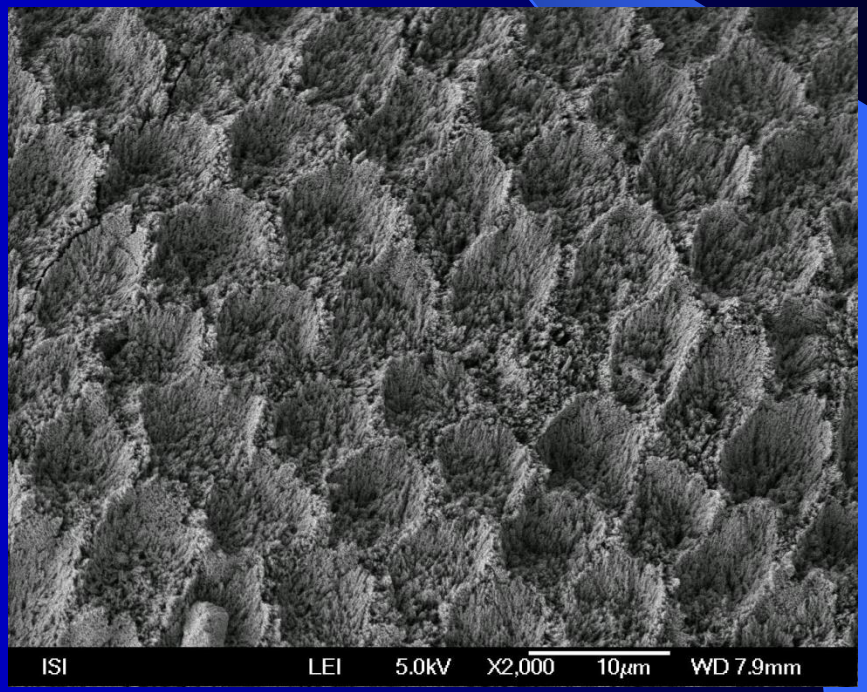
Acid etching of enamel

Irregular surface – retentive pattern

Speces between enamel rods or in enamel rods are created

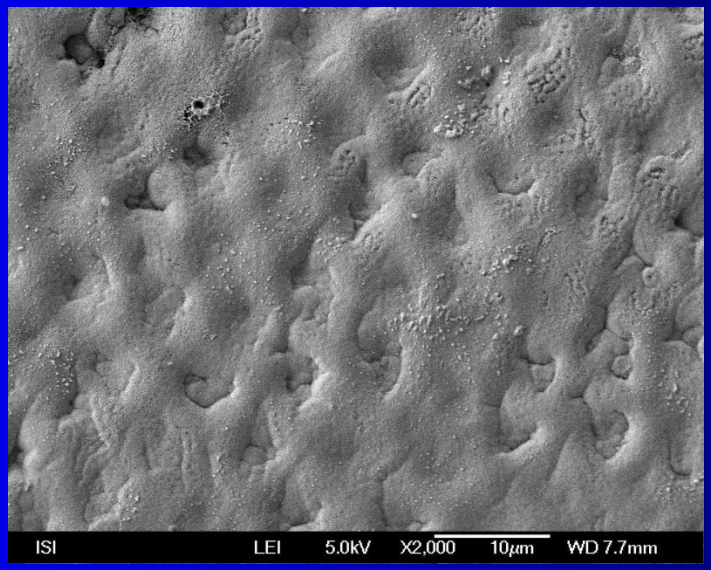
The material flows into these spaces





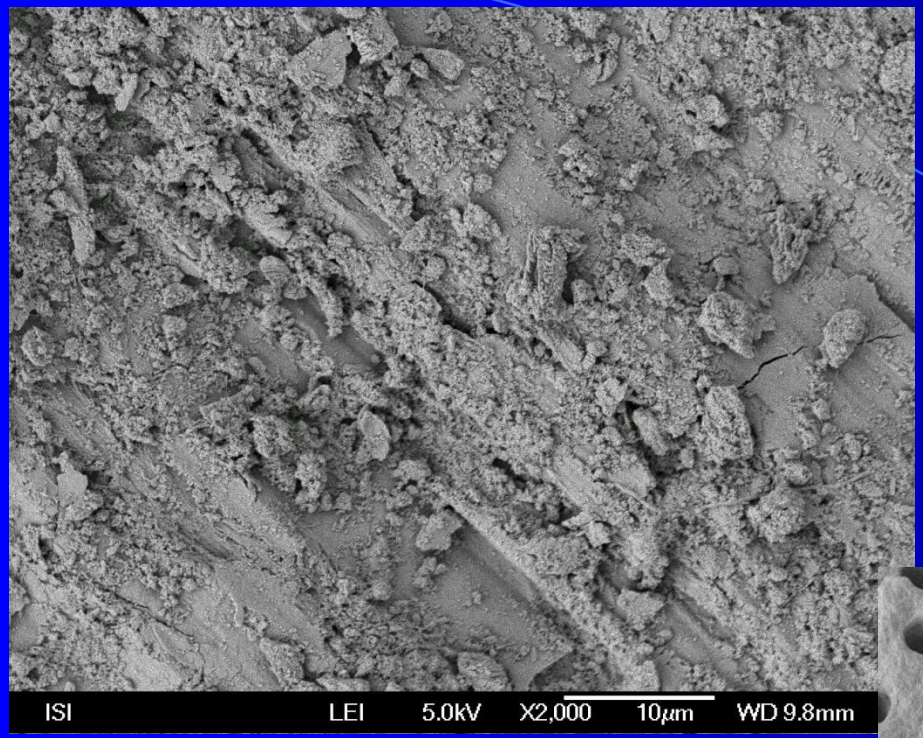
Aprismatic enamel

- On the surface of enamel there is aprismatic enamel. It is difficult to be etched in order to achieve the retentive pattern. It must be removed with diamond (red coded, fine)

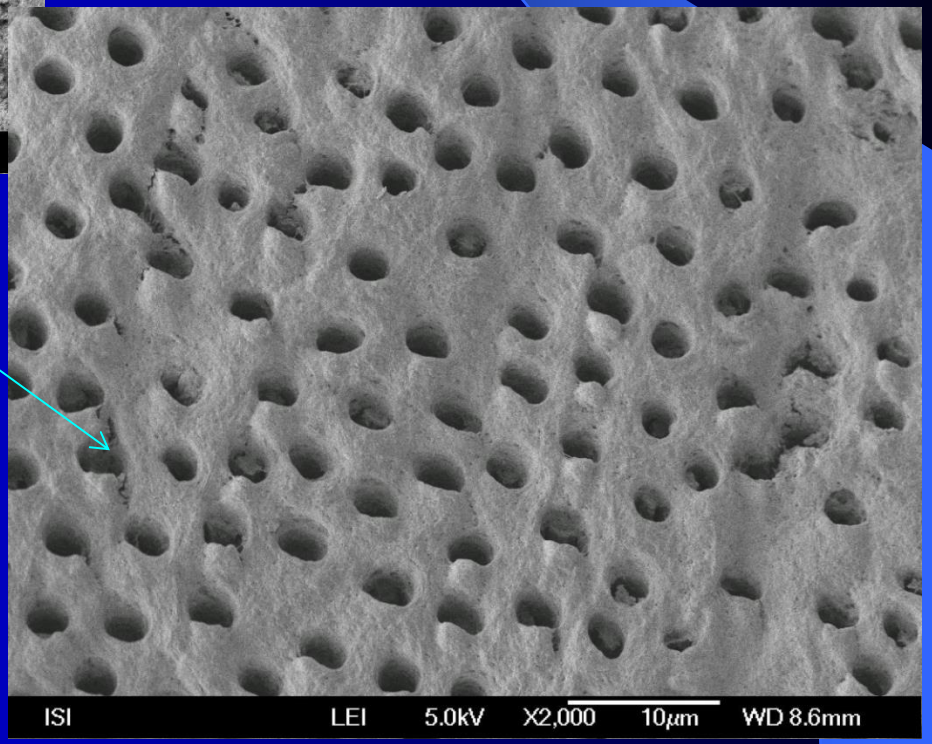


Retention in dentin

- More water and organic components
- Tubular liquor
- Smear layer (layer after preparation composed of collagen fibers, crystals of hydroxyapatite that have been destroyed during preparation and microbs)

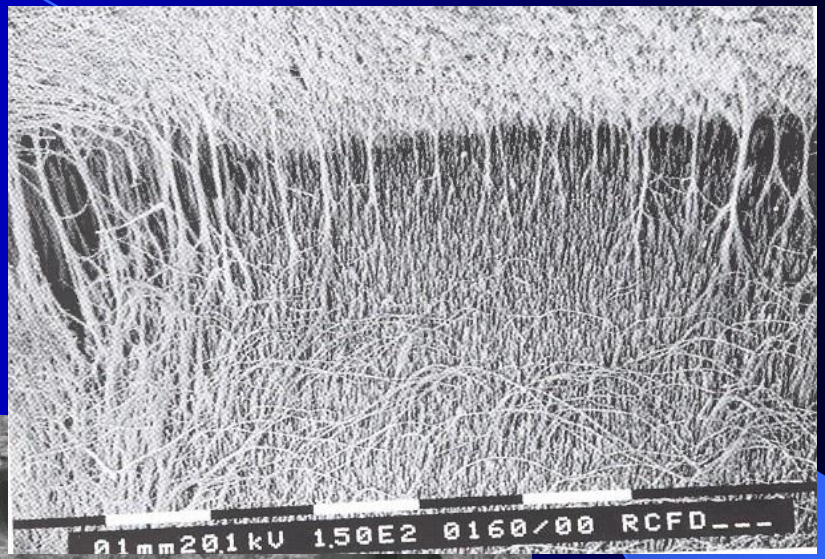


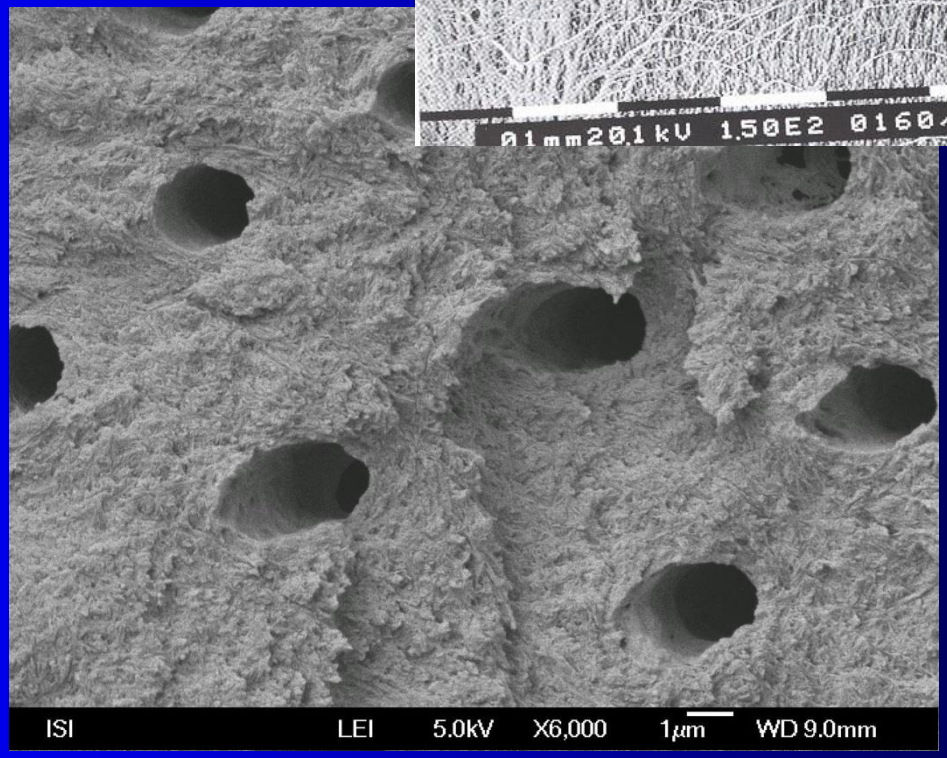
Smear layer



With acid etching
smear layer is
removed,
dentin tubuls are opened and
the surface of collagen
network decalcified

The material can flow into dentin tubules and penetrates into spaces in collagen network.
This is also micromechanical retention





35% - 37% phosphoric acid
silica particles
blue dye

Adhesive system

- We need adhesive systém for penetration into microscopic spaces after acid etching.

It consist of primer and bond

Bond

- **Flows into spaces in enamel after etching, into dentin tubules and to spaces in collagen network. Dentin must be pretreated with primer.**

Primer

Open the collagen network in dentin and keep it open: Withiout it the bond wolud not be able to penetrate inside.

Making filling

- Preparation
- Enamel is beveled in most cases – retentive border
- Acid etching
- Washing
- Bonding
- Placement of filling material – in portions
- Curing with light
- Finishing and polishing (extra and ultrafine dimonds and rubber instruments)

Glassionomers

Composition

Powder: Aluminiumsilicate glass(SiO_2, Al_2O_5, CaO, N_2O,P_2O_5, F)

Liquid: Polyacid

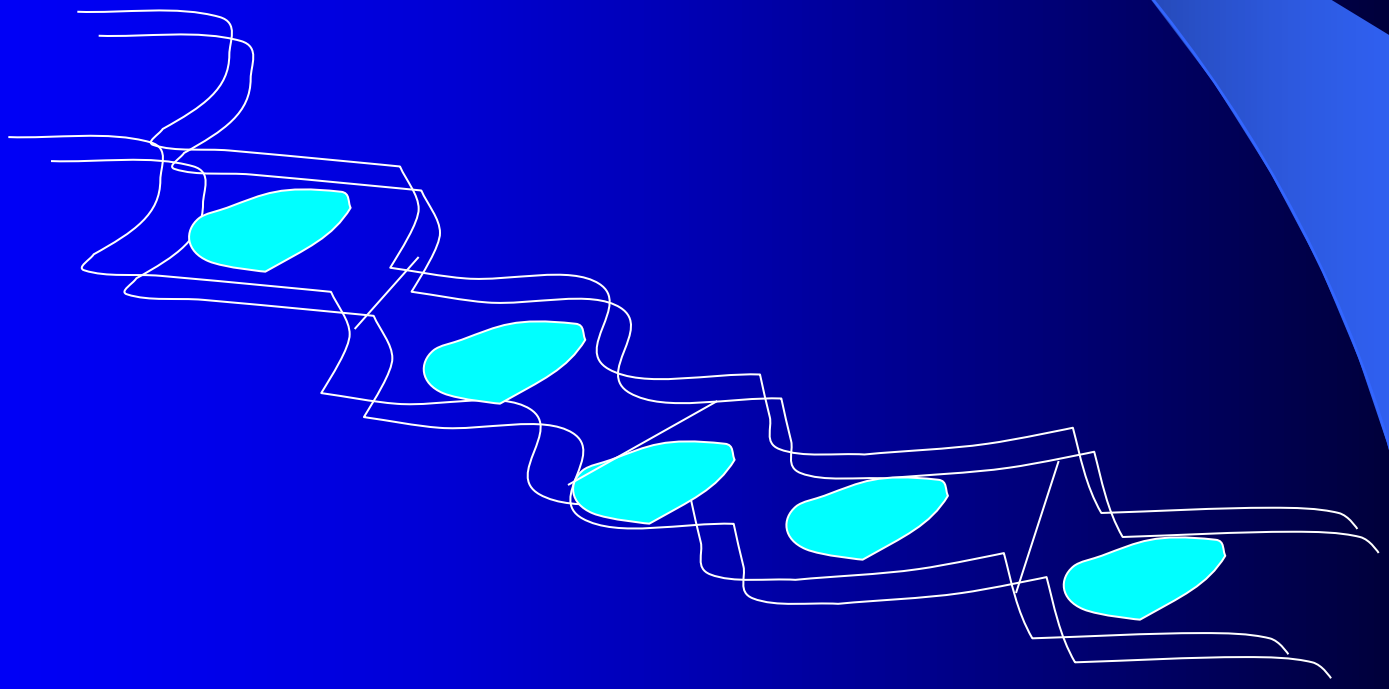
(polyacrylic, polymaleic)

Tartaric acid,

Water

Glassionomers

- Principle of setting – acid base reaction



Glassionomers

- Chemical bonding to hard dental tissues
- Thermal expansion similar to dentin
- Realease fluoride ions

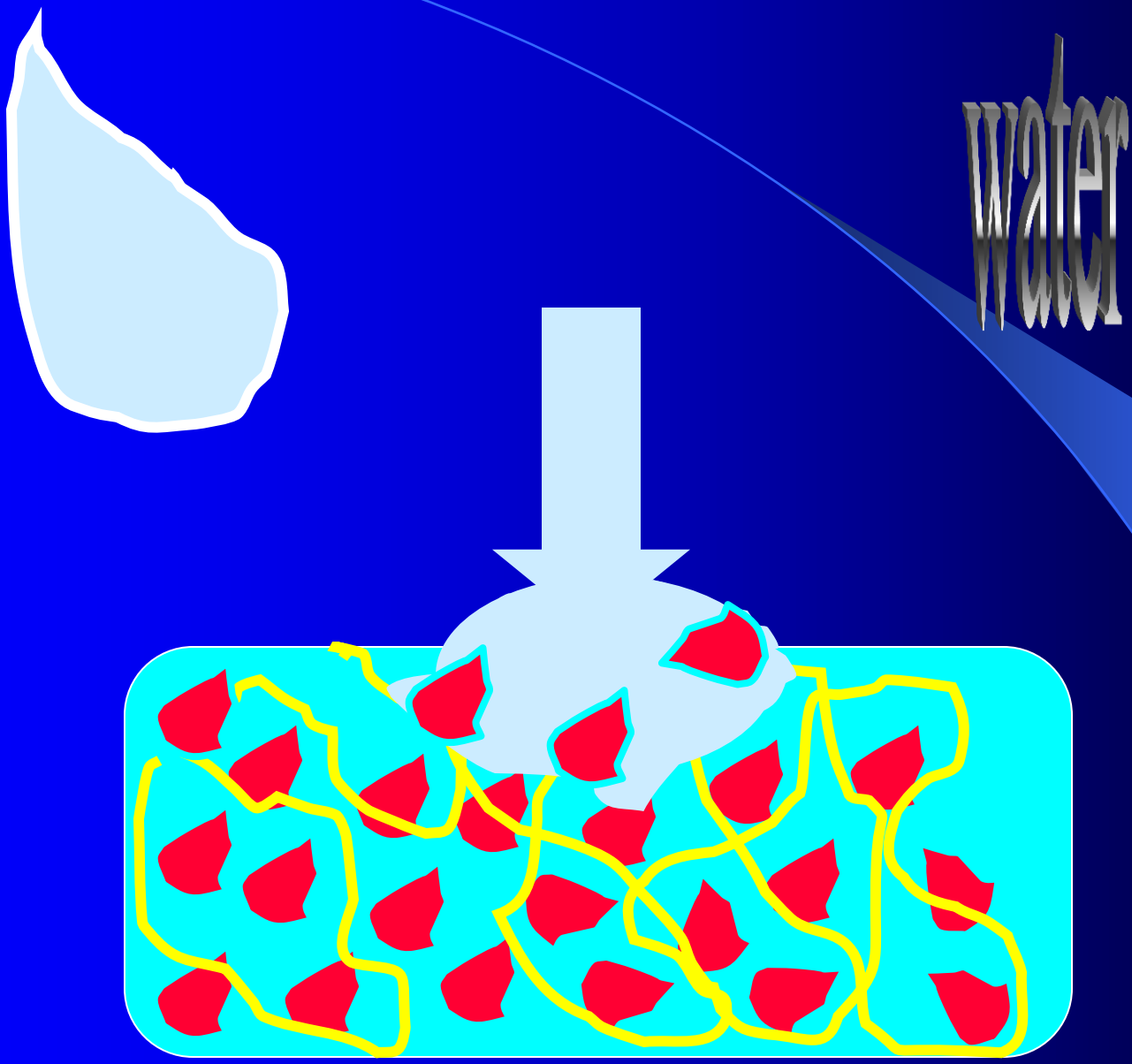
Mechanical not strong enough

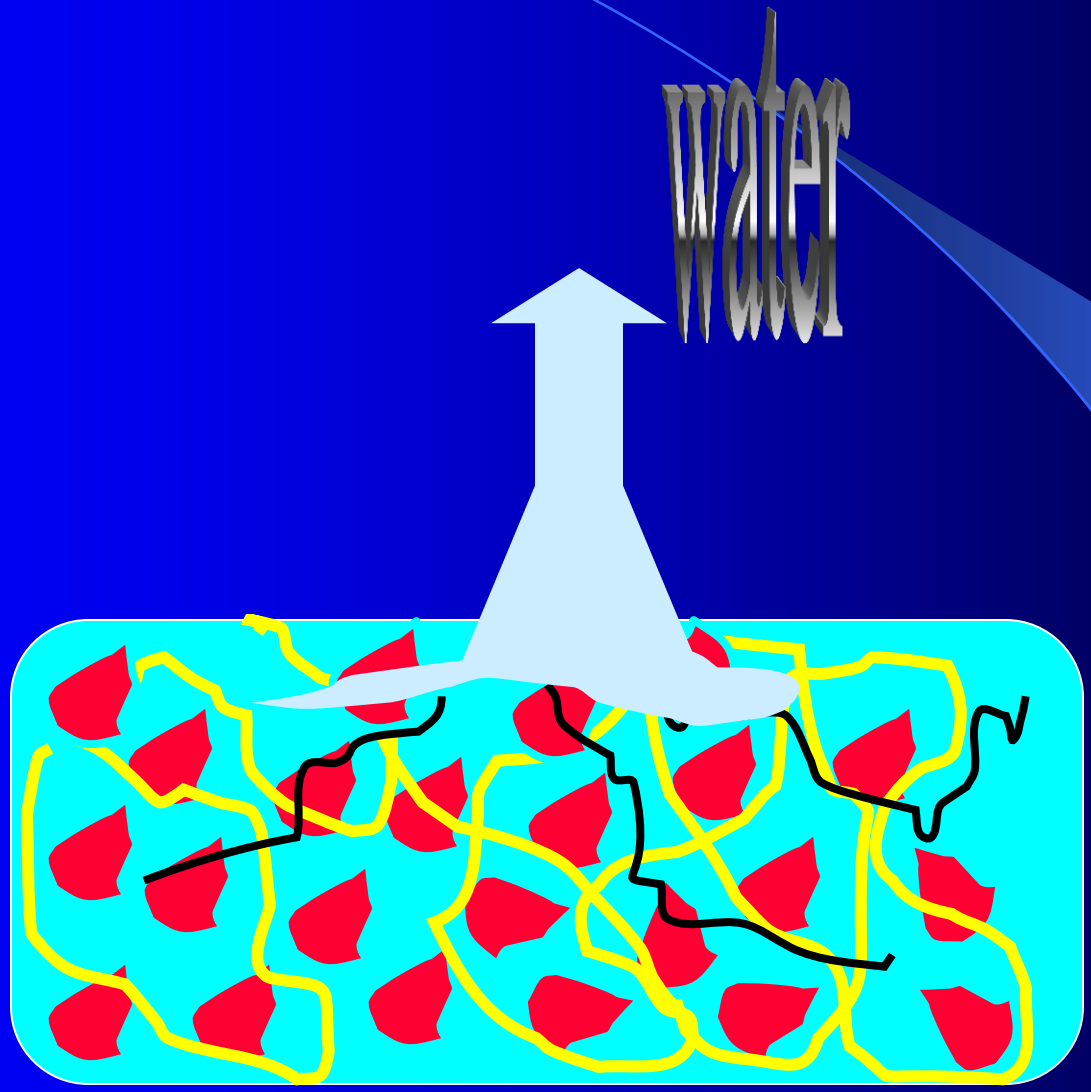
Aesthetics acceptable

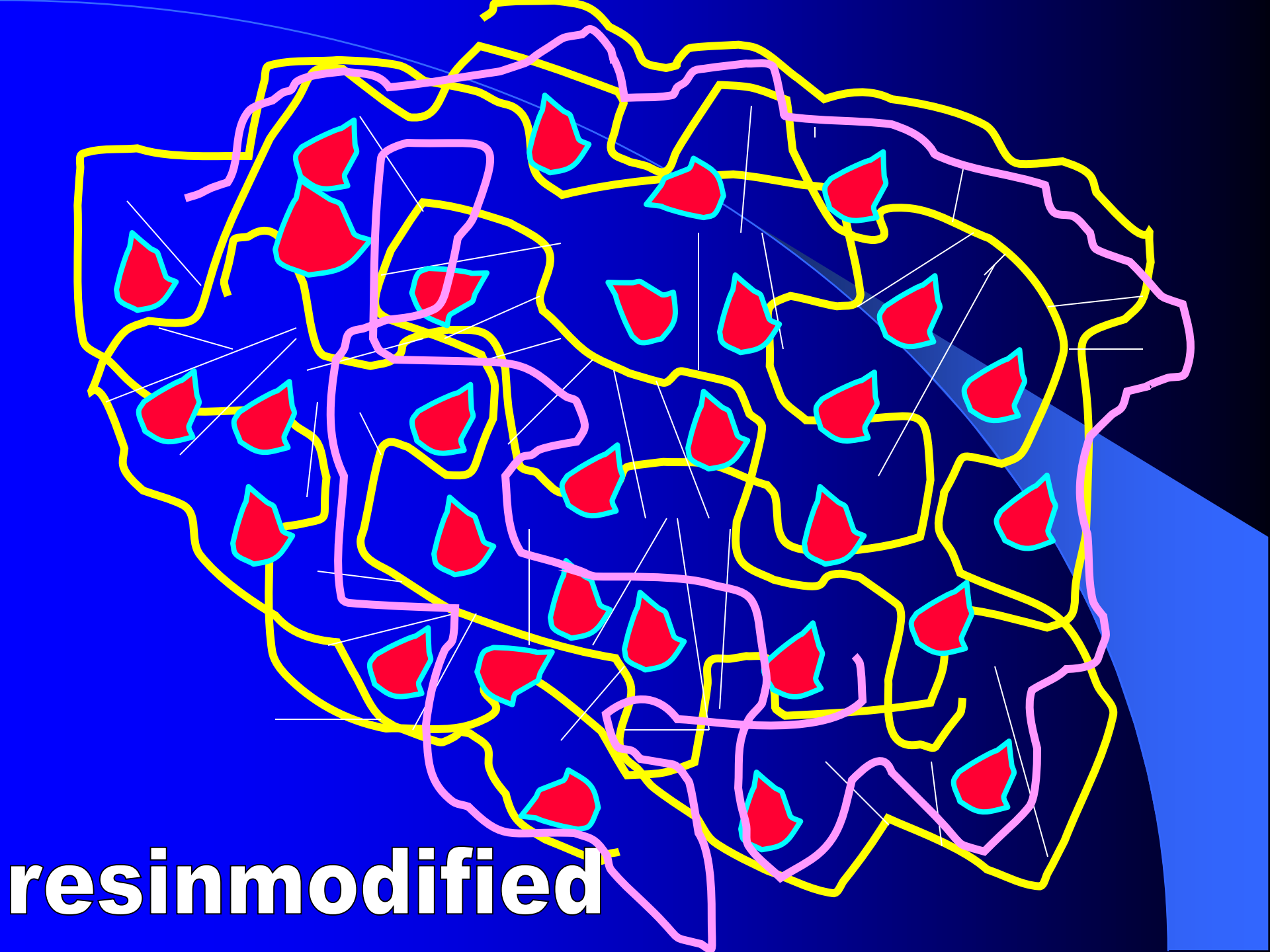
Glassionomers acc to curing

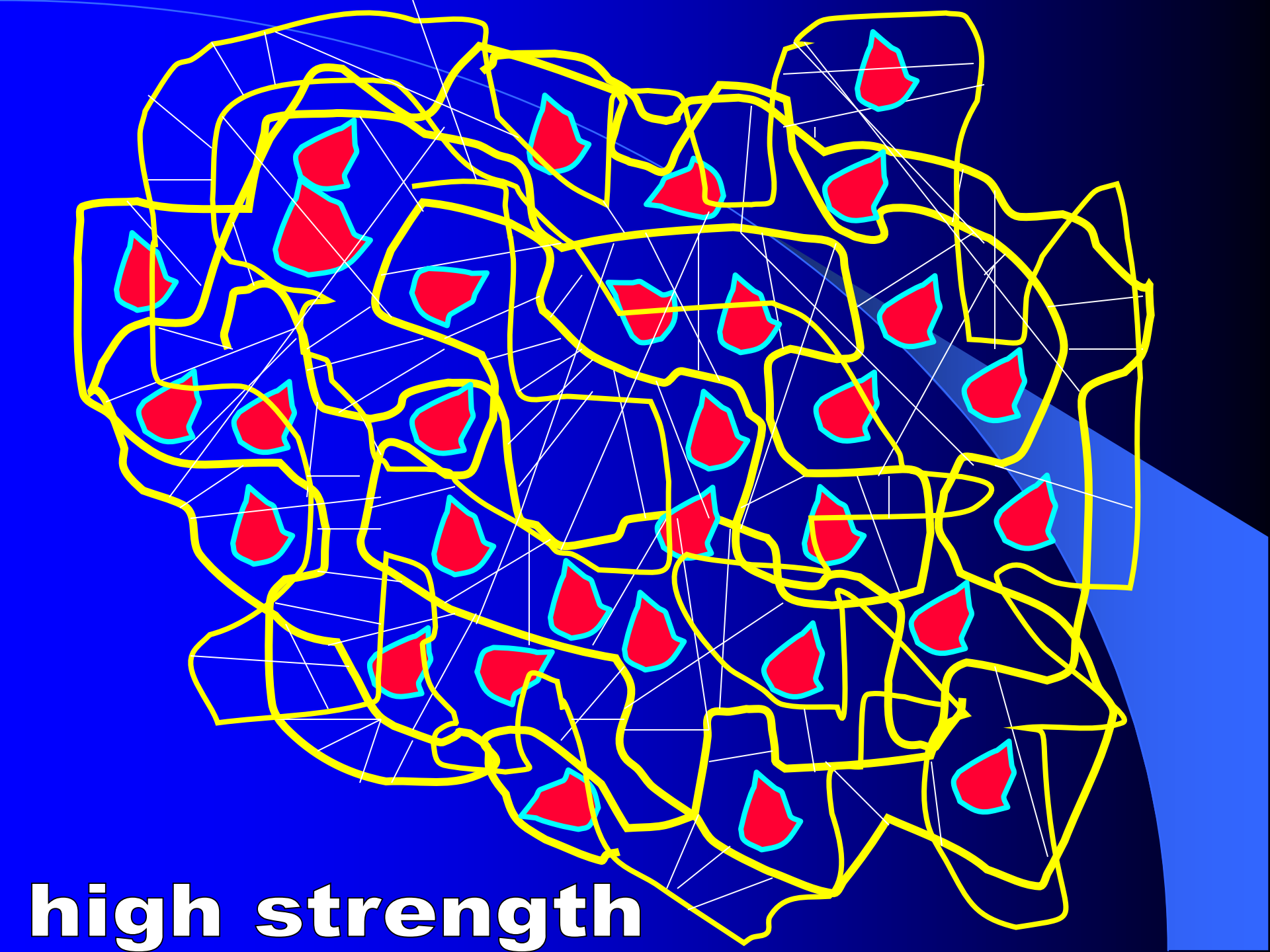
- Acid – base reaction
- Dual cured glassionomers (resin modified)


dentin


water


water


resinmodified


high strength

Glassionomers - indications

- Fillings

Class V., III., I., II

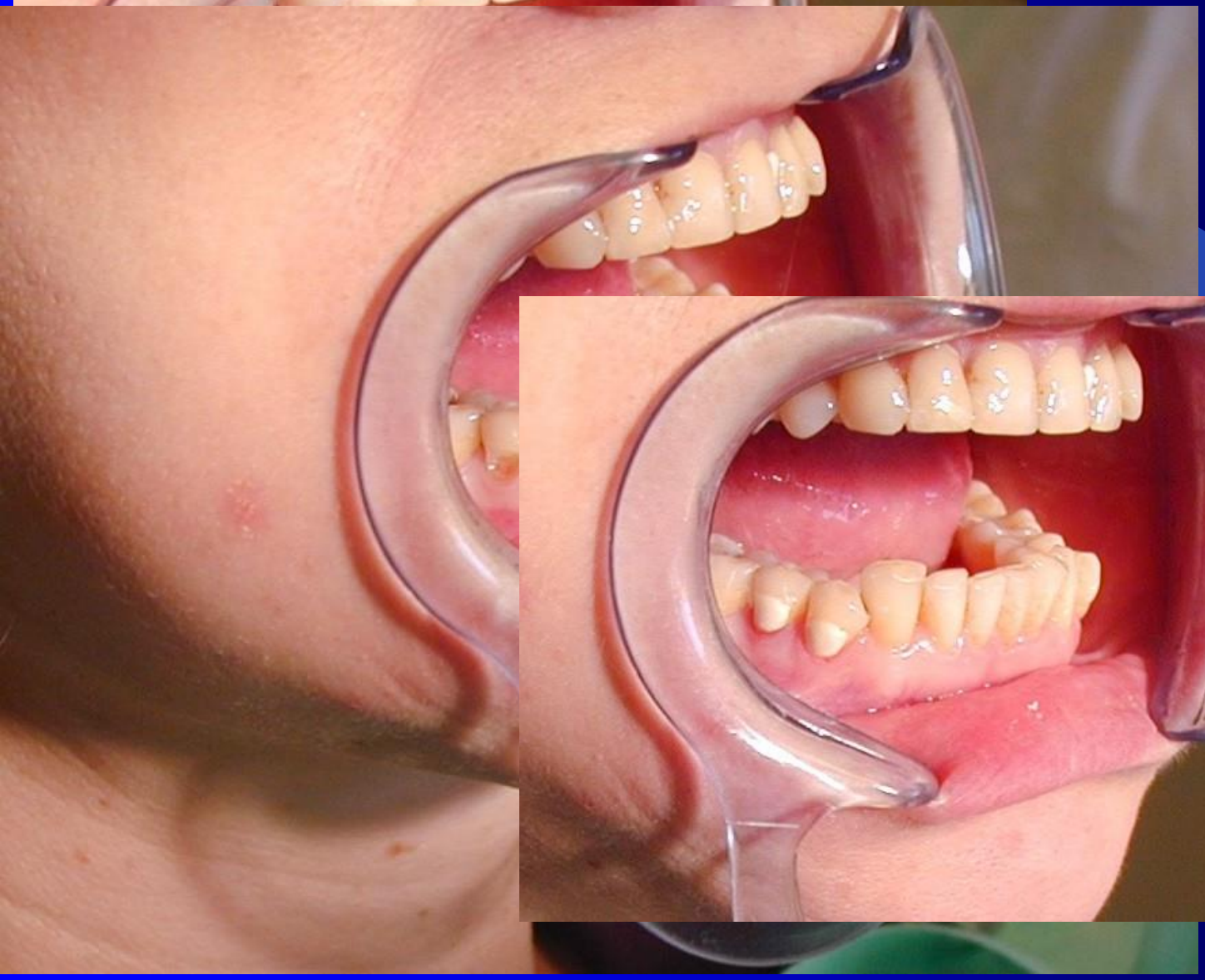
Sealants

Protection of tooth surface

Mixing

Hand

Power driven - capsulated

Making filling

- Preparation
- Smoth bordes
- Limited on caries lesion only
- Conditioning
- Washing
- Filling in one block
- Varnish after setting
- Polishing in next appointment