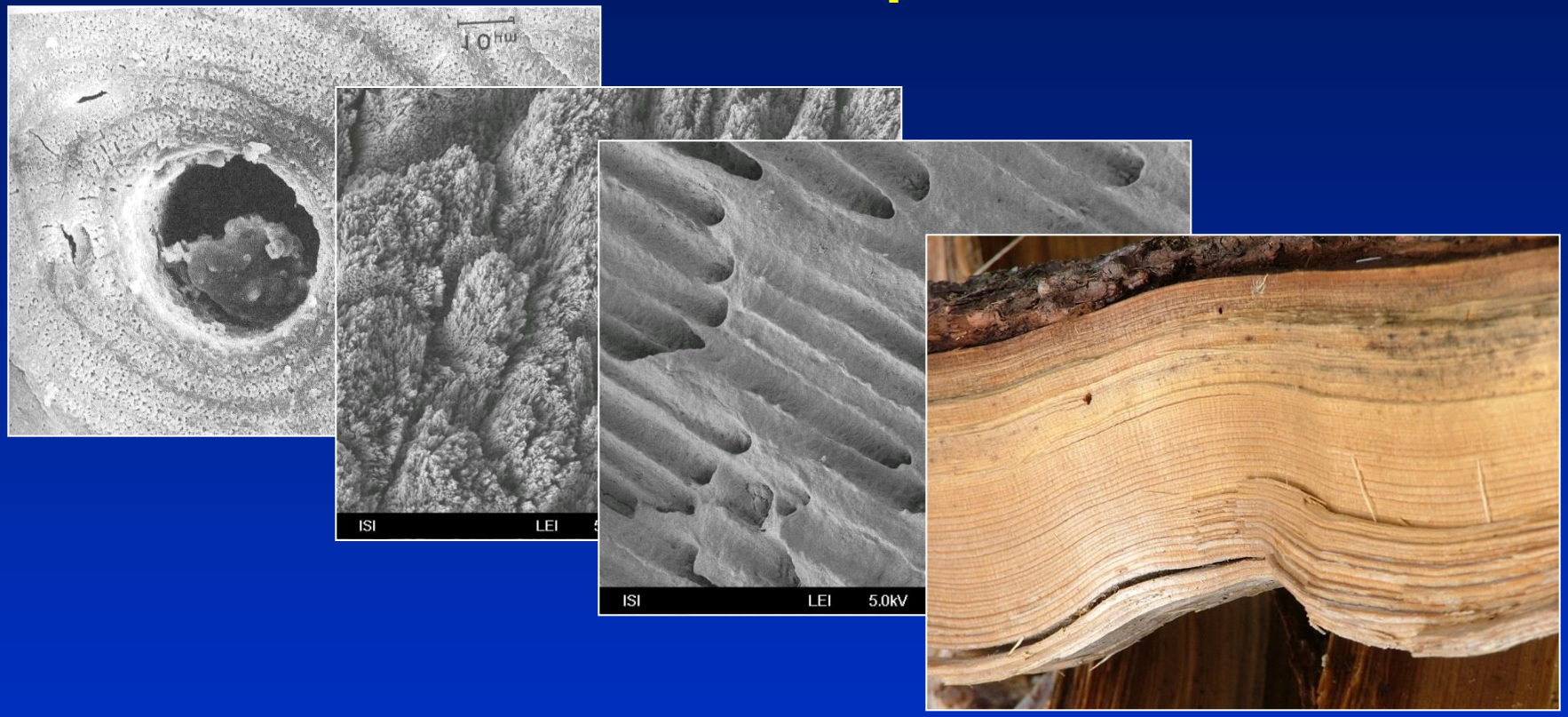
Restorative dentistry - aesthetics

Contemporary trends

- Minimally invasive approach
- Adhesive materials and techniques

Composites

Natural composites



Combination of materials – final product has much better properties in comparison to summation of the components

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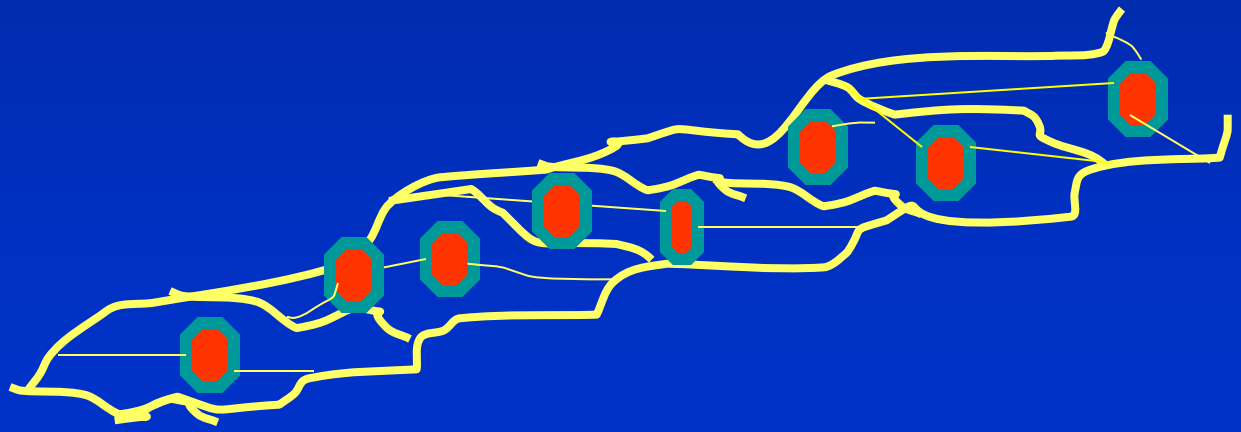
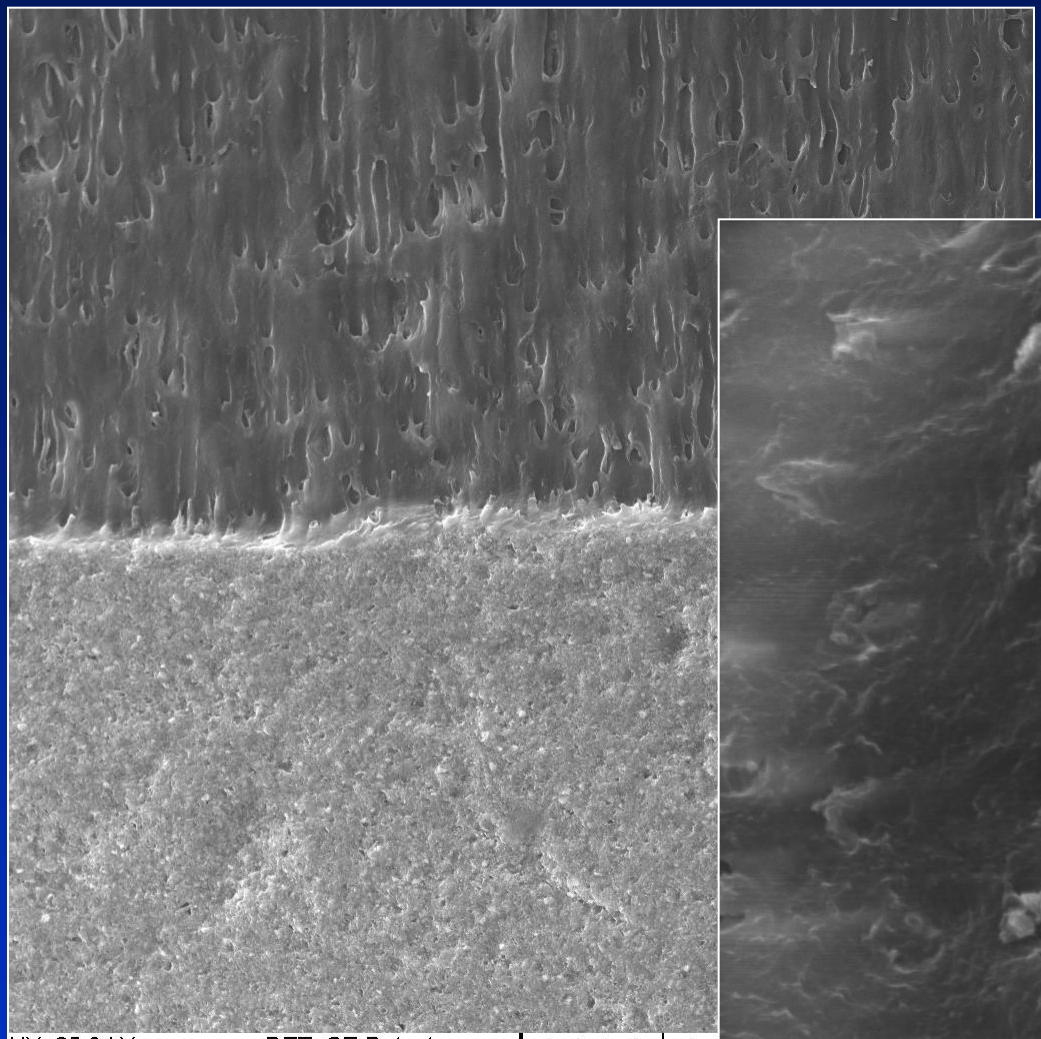
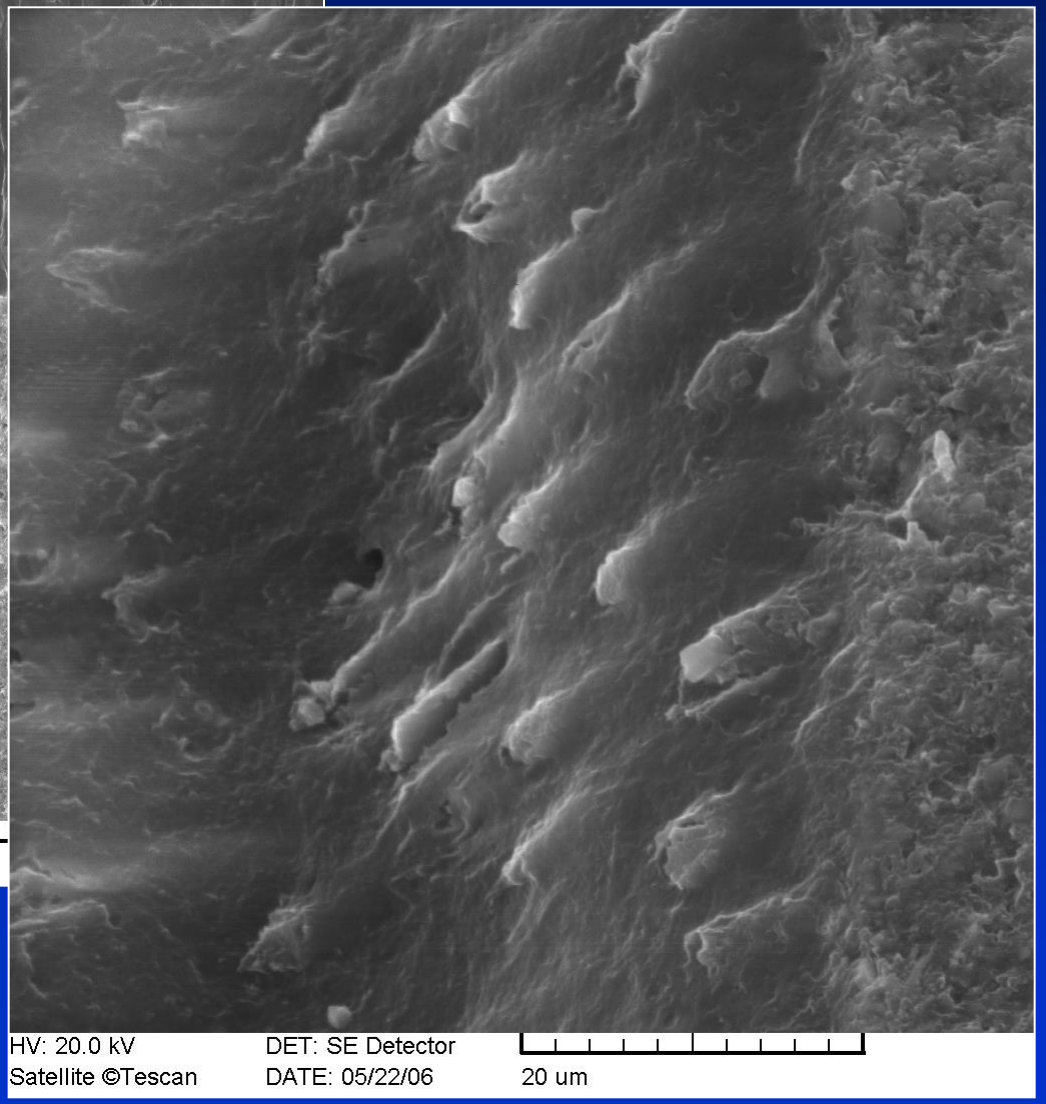
Composites in dentistry

Chemically bondedn mixture of organic matrix and inoprganic polymer



Adhesion

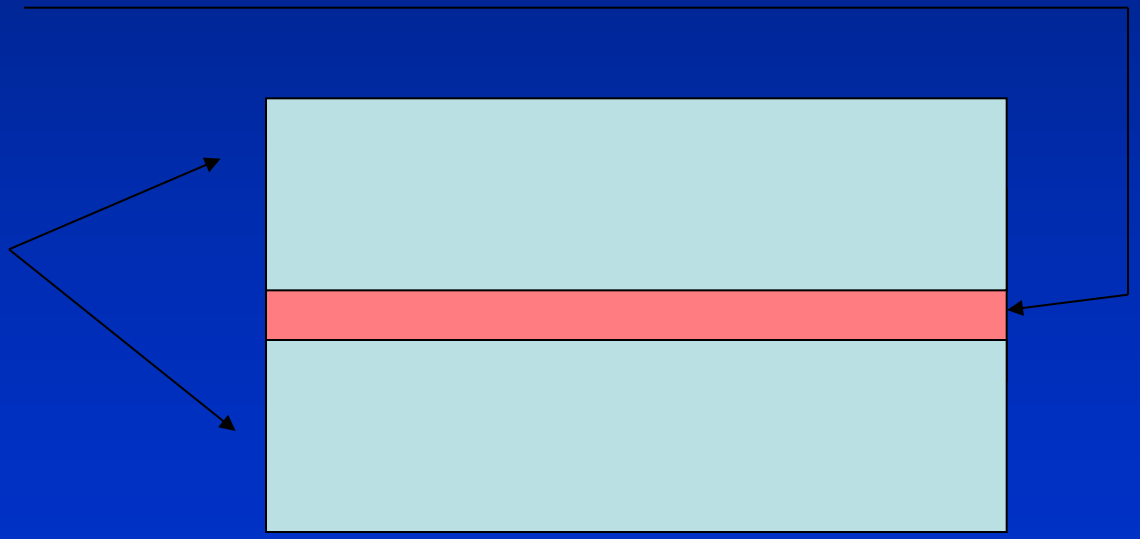

HV: 25.0 kV
DET: SE Detector
Satellite ©Tescan
DATE: 05/10/06
100 um


HV: 20.0 kV
DET: SE Detector
Satellite ©Tescan
DATE: 05/22/06
20 um

Bonding

Adhesion

- Adhesive
- Adherend



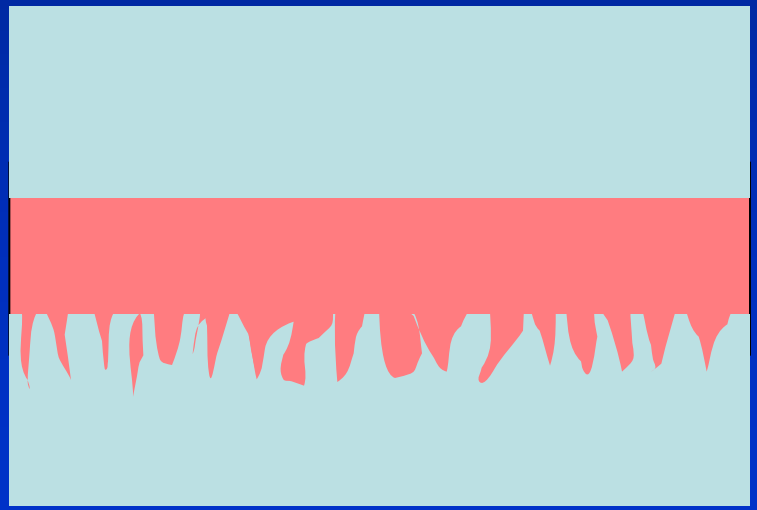
Adhesion

- **Mechanic**
- **Specific**

Adhesion

Mechanic

Irregulartiies of the surface



Adhesion

- **Specific**

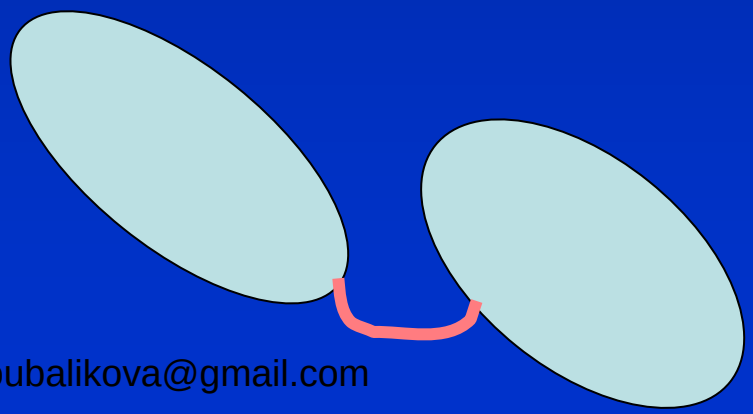
Physical

Chemical

Adhesion

- **Specific**

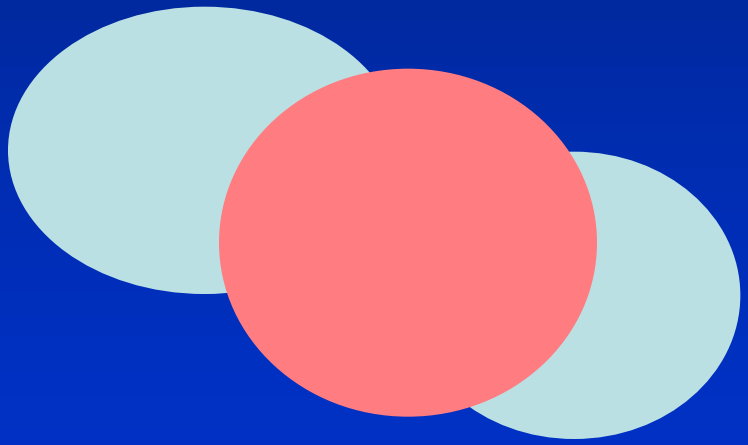
Physical – intermolecular forces - Van der Waals, hydrogenium bridges



Adhesion

- **Specific**

Chemical



Adhesion

- **Sandblasting**
- **Electrolytic**
- **Silanization**
- **Plazma coating**
- **Silanization**

Adhesive preparation of surfaces

- Creates irregularities
- Increases surface energy

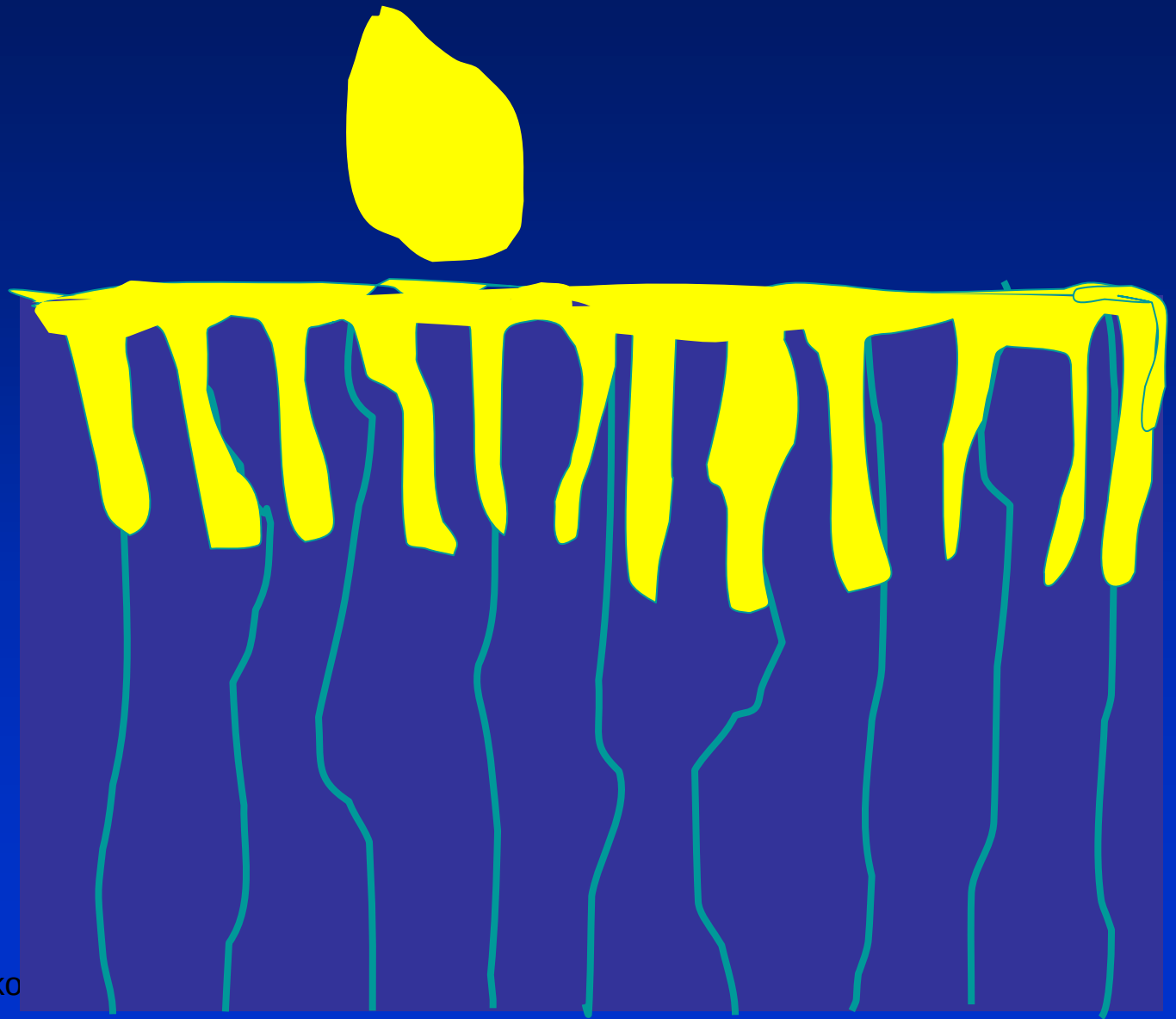
Adhesion of dental materials

Composites - micromechanical

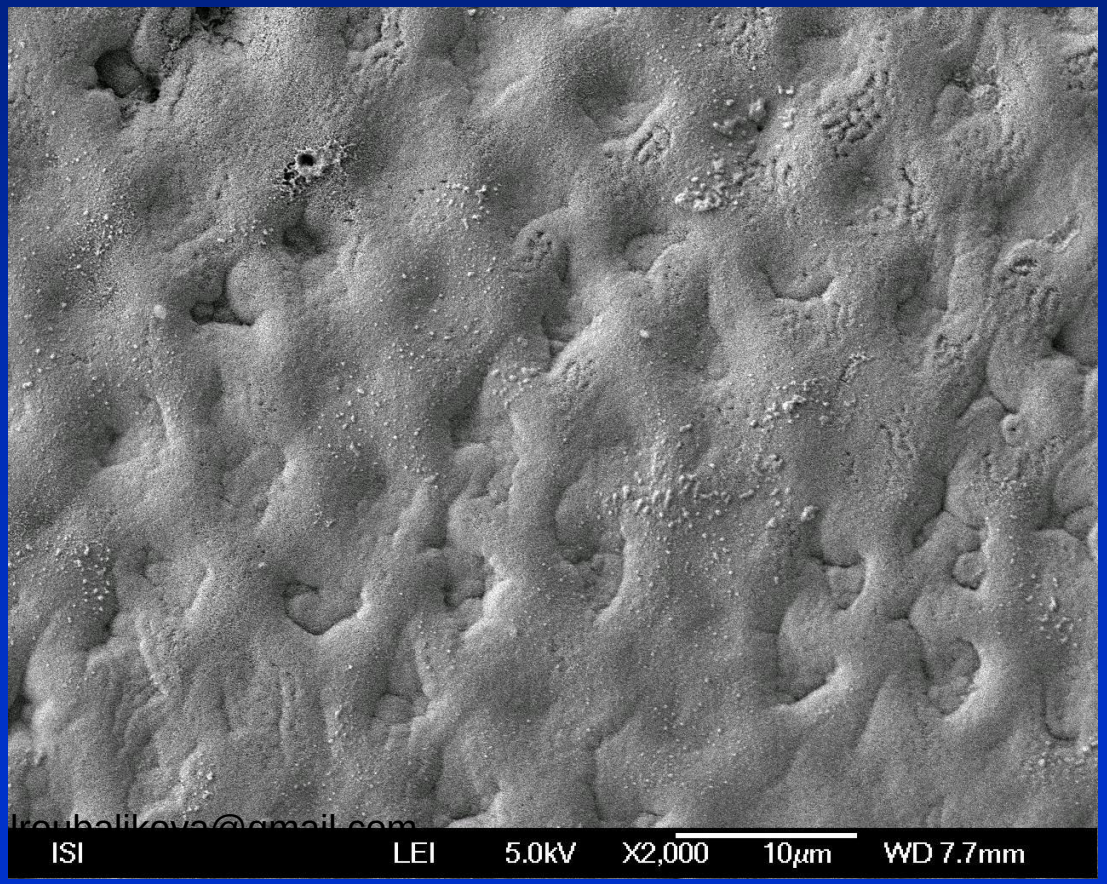
Adhesives – micromechanical, specific

Glassionomers - specific

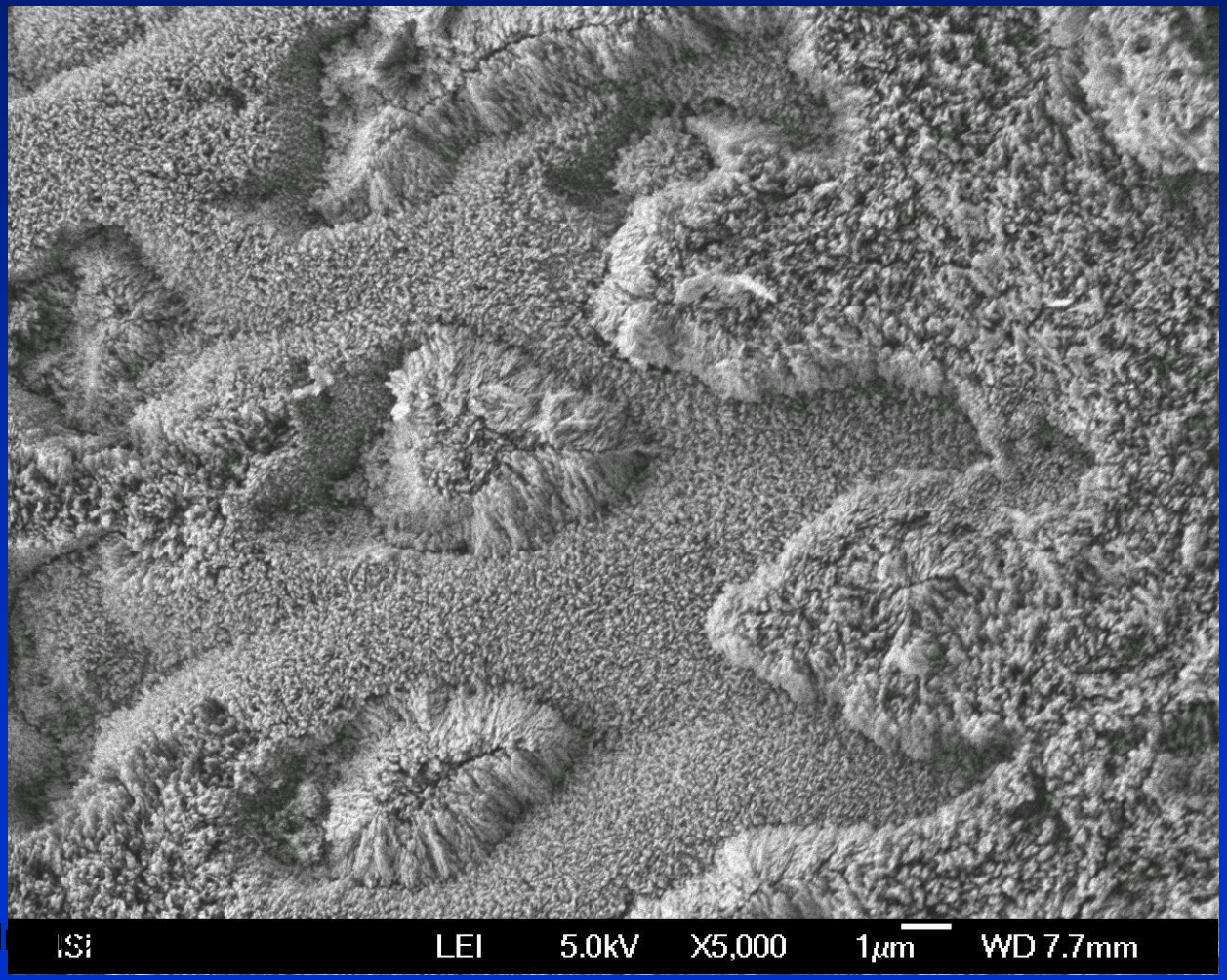
Enamel



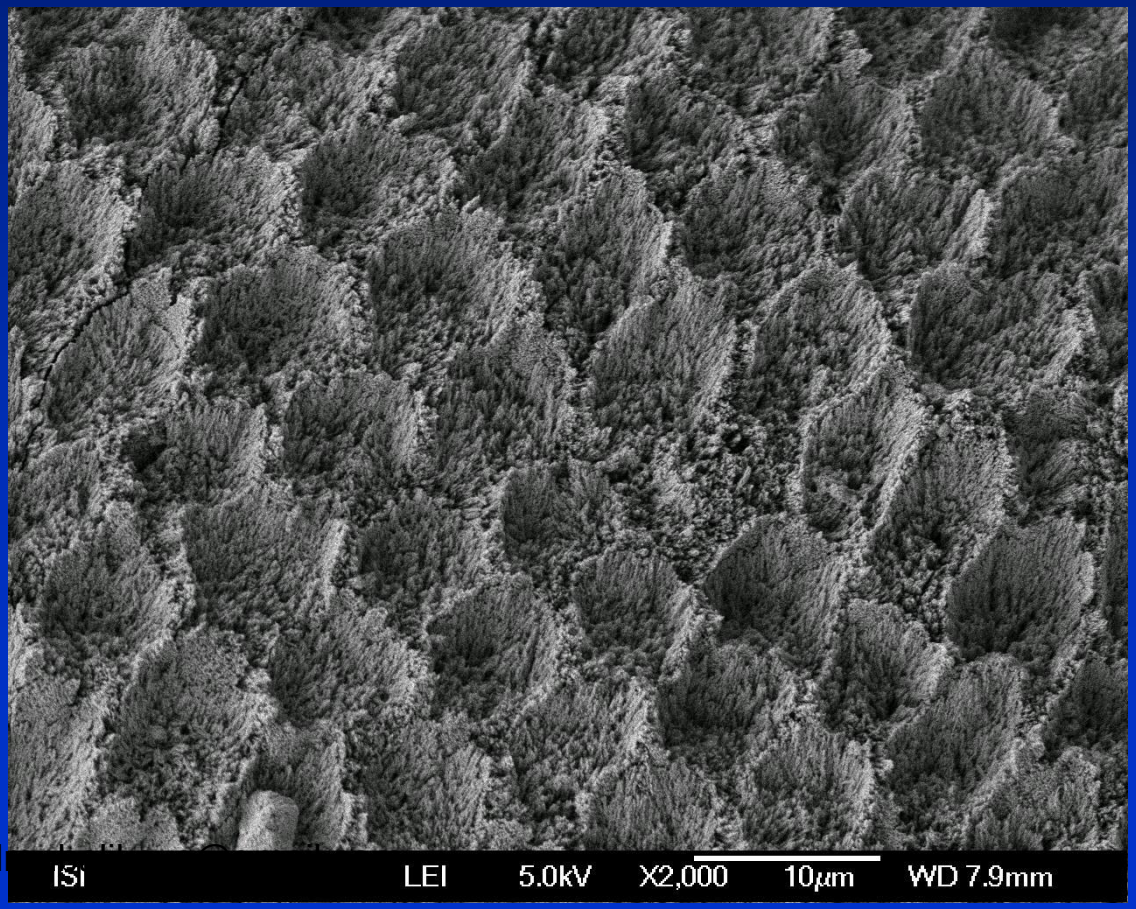
Aprismatic enamel



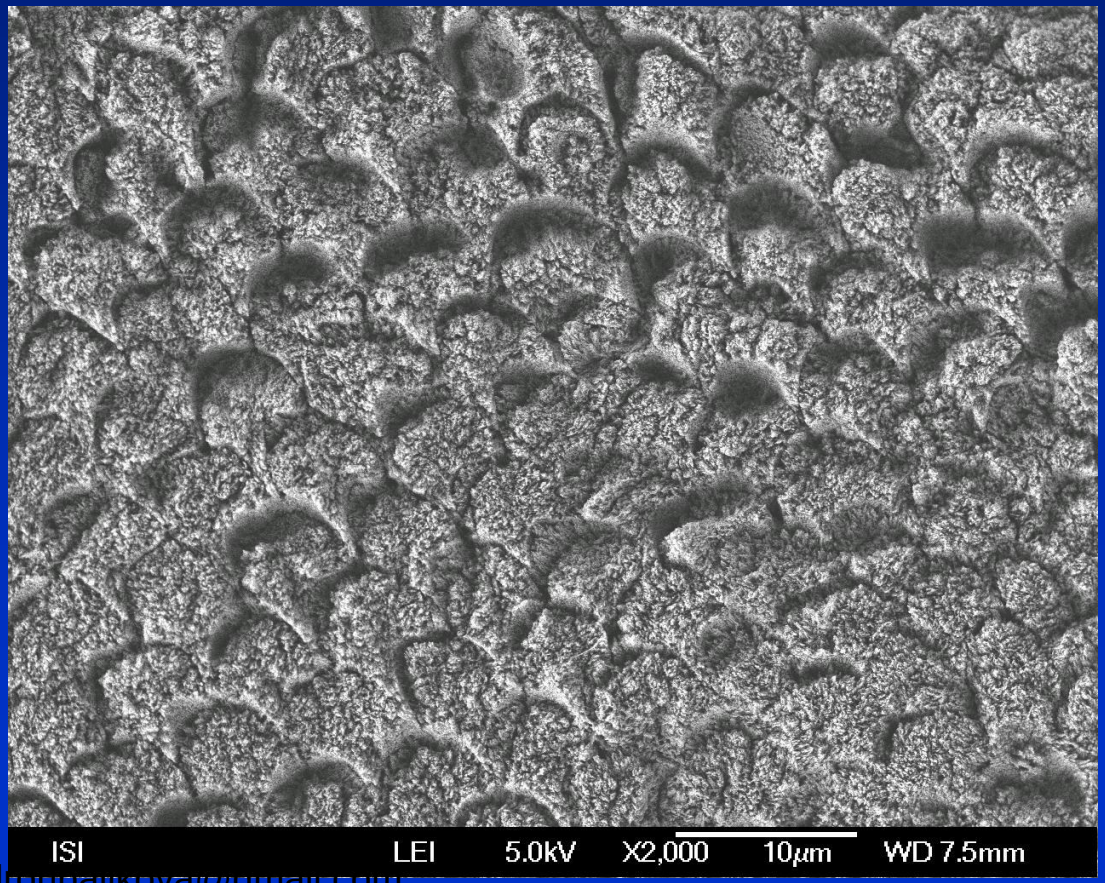
Aprismatic etching, aprismatic retentive pattern



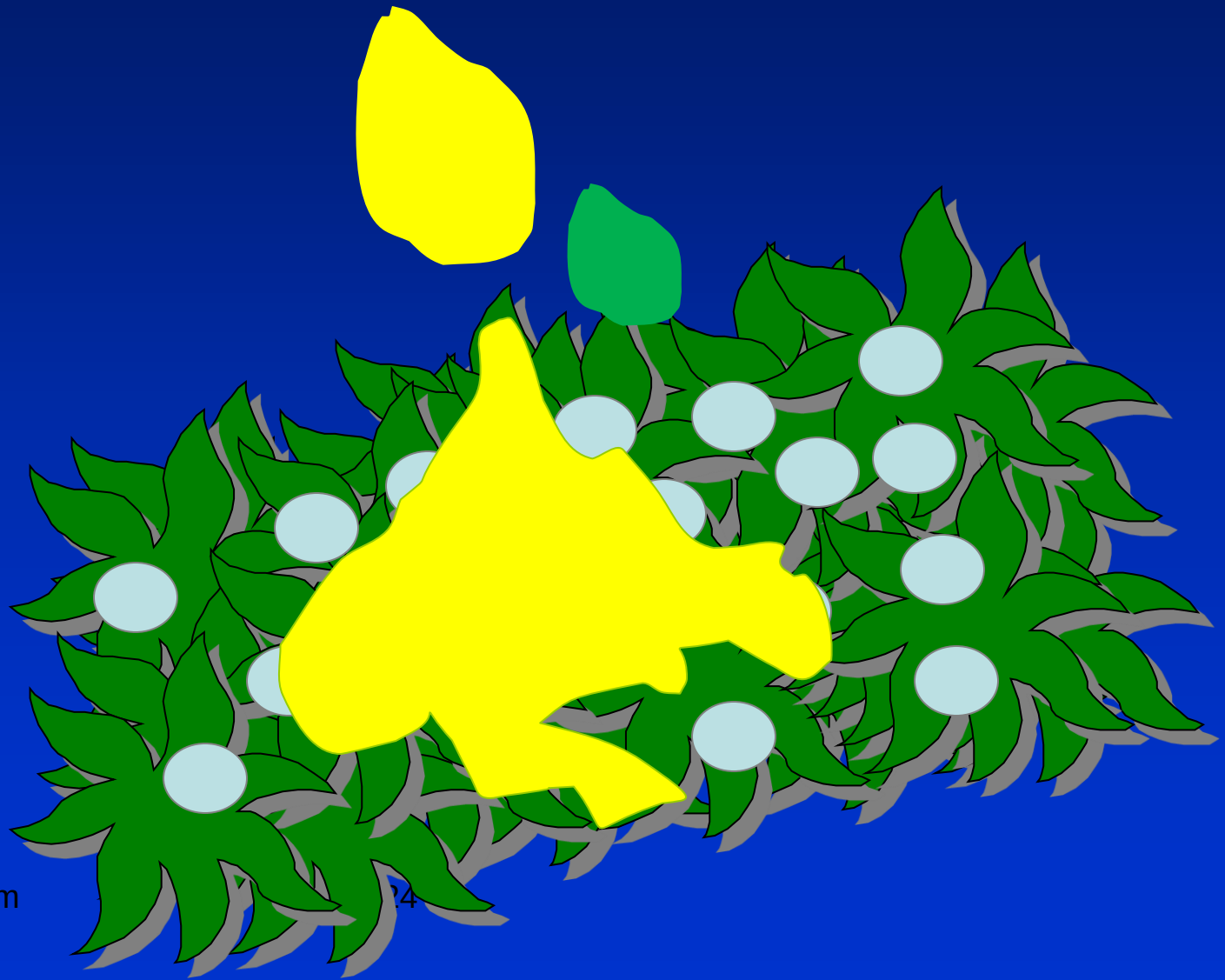
Intraprismatic retentive pattern



Interprismatic retentive pattern



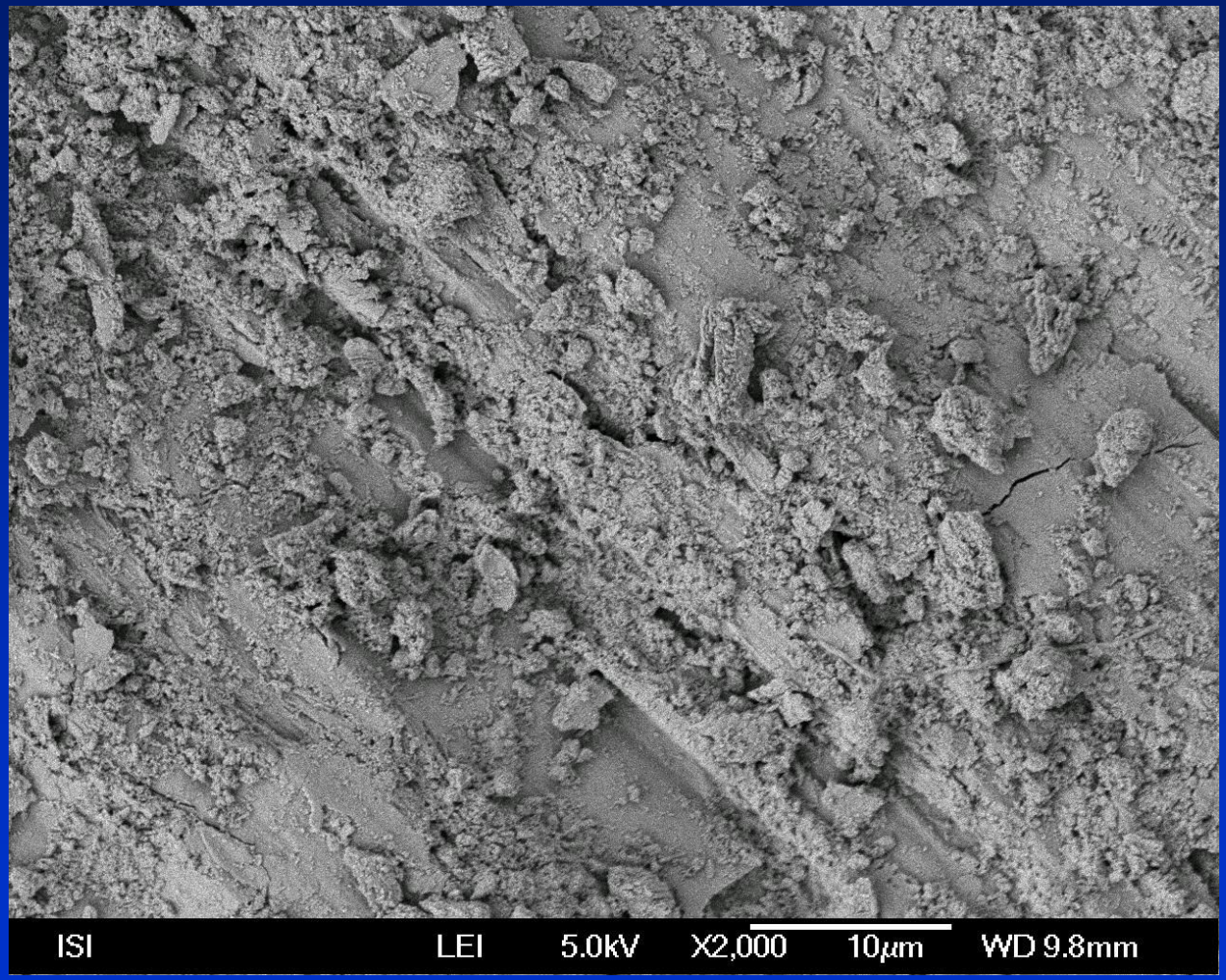
Dentin



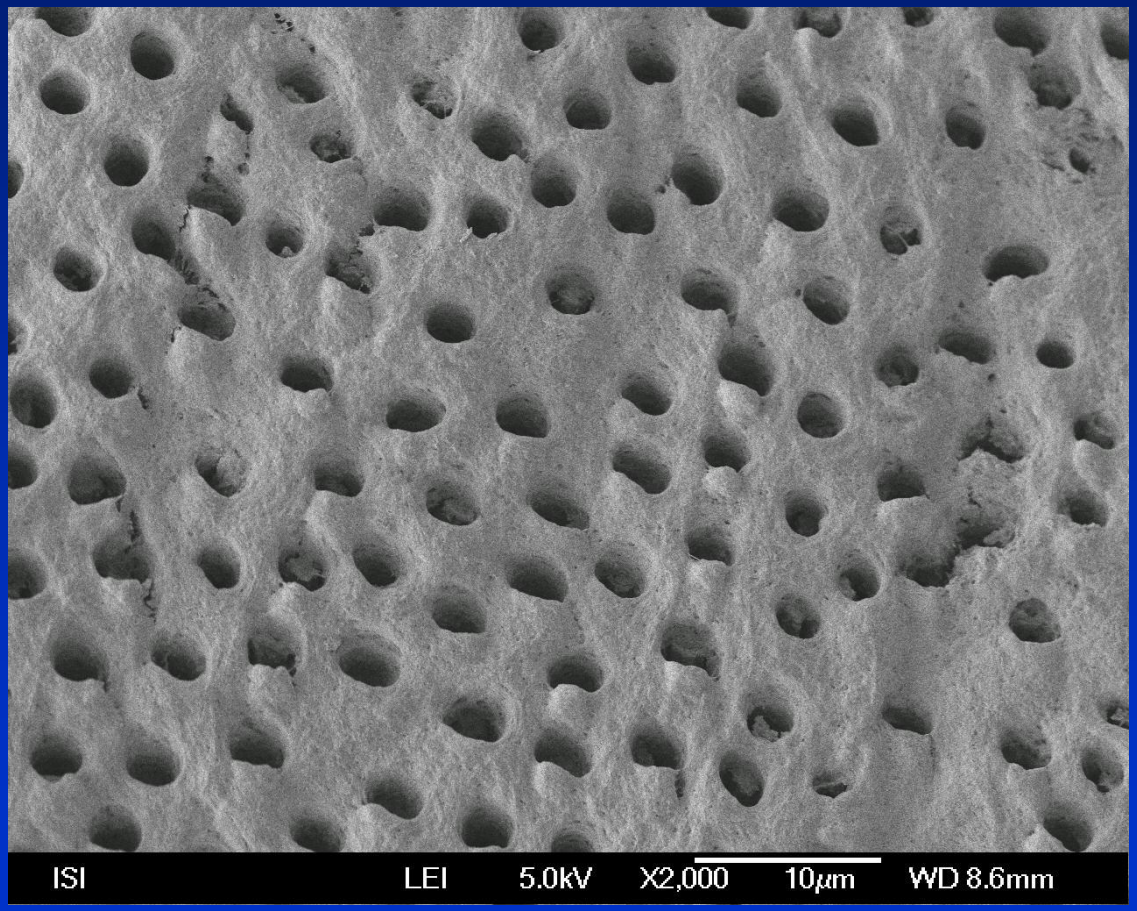
Dentin

- More water and organic substances
- Low surface energy
- Tubular liquid
- Connection with pulp chamber
- Smear layer
- Variable composition of dentin (young, old person, cavity, root canal).

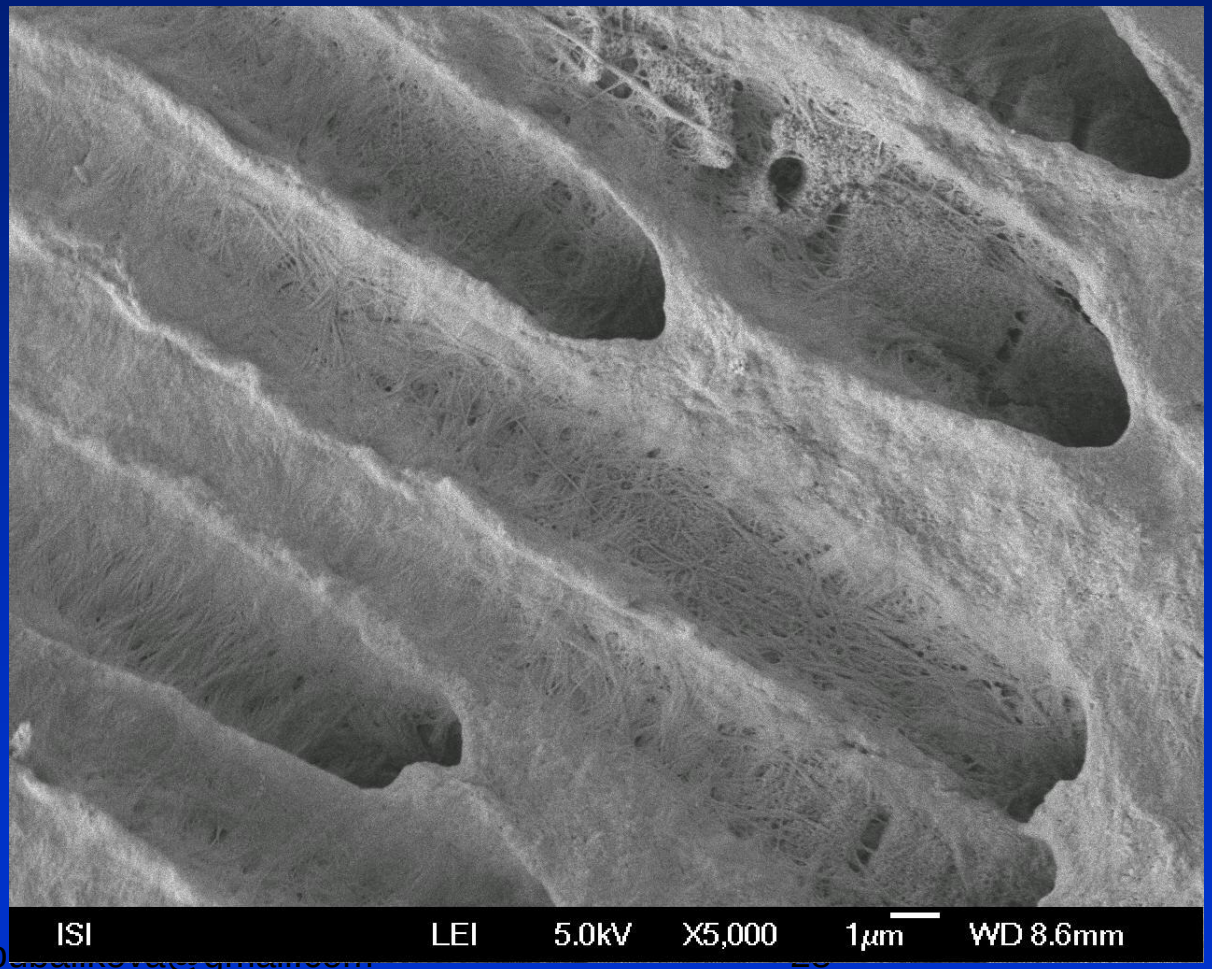
Smear layer



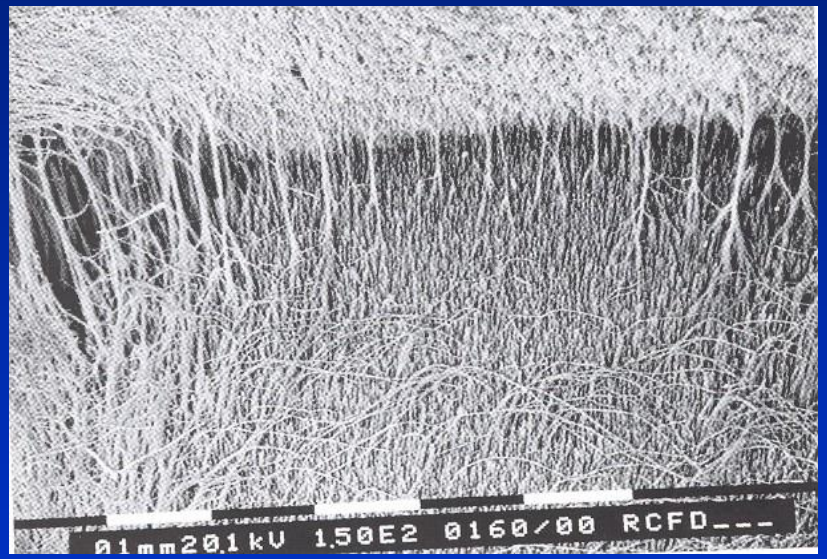
Etched dentin



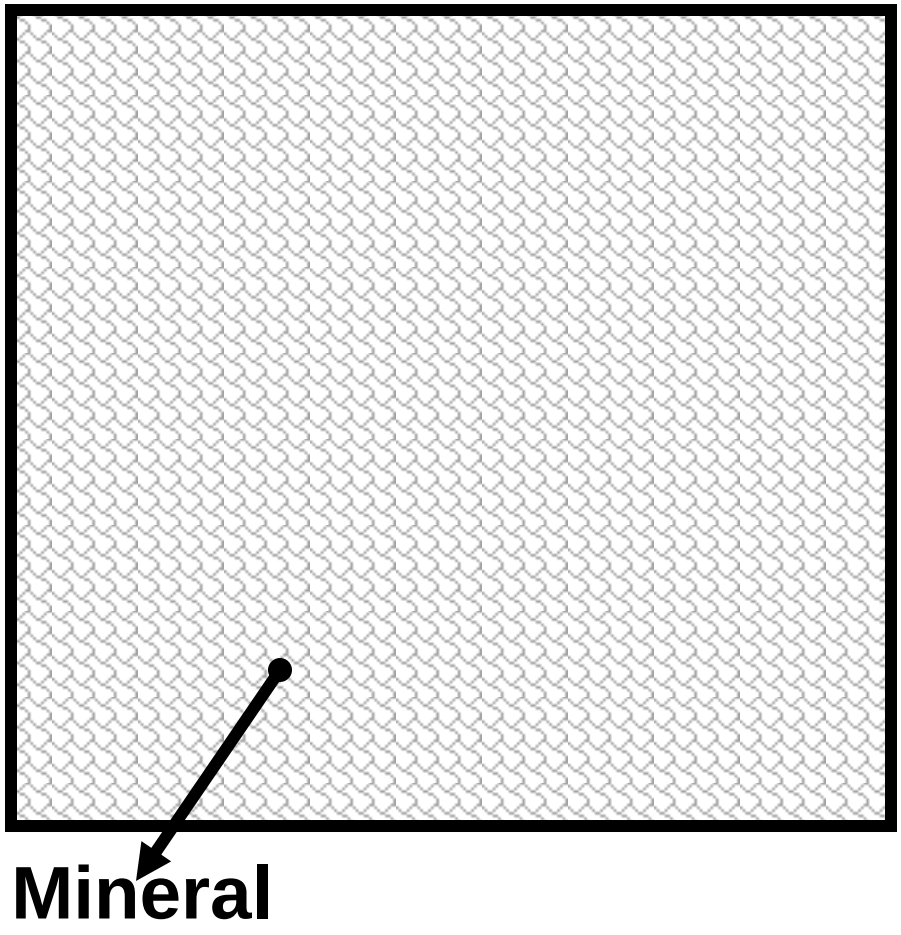
Dentin tubules with collagen fibres



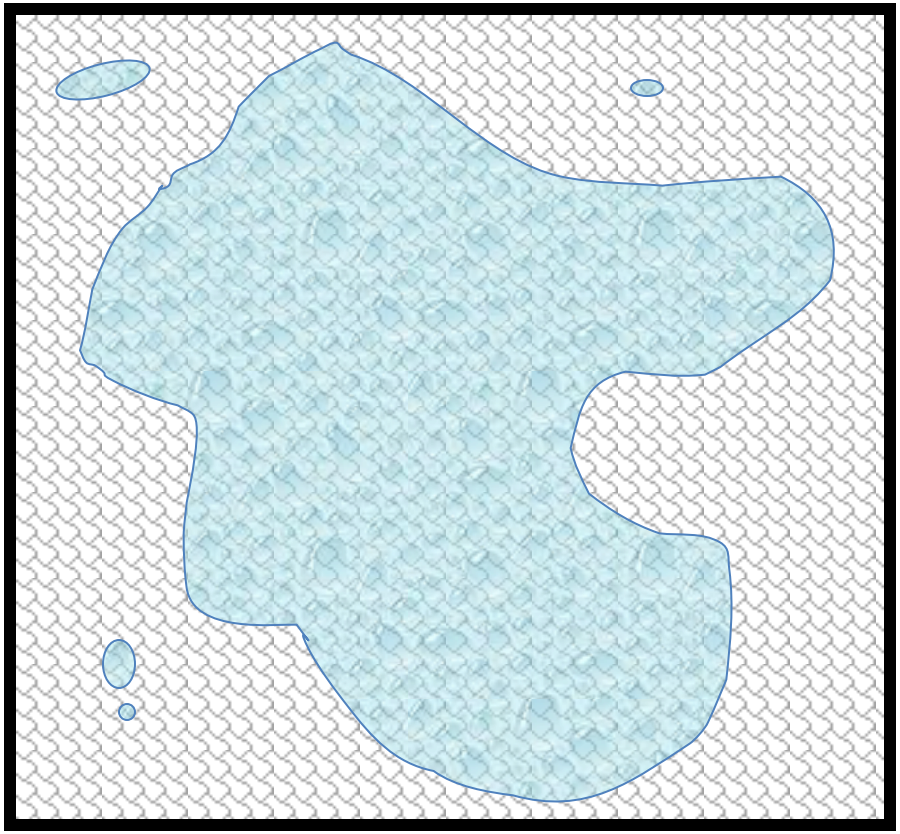
Dentin tags

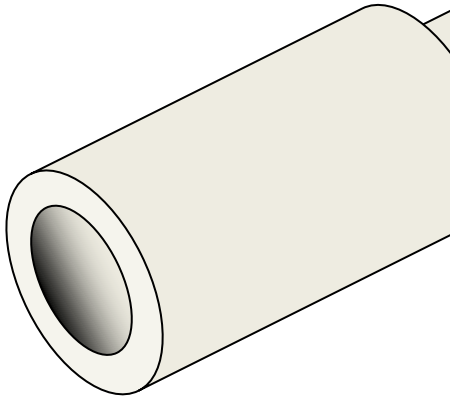


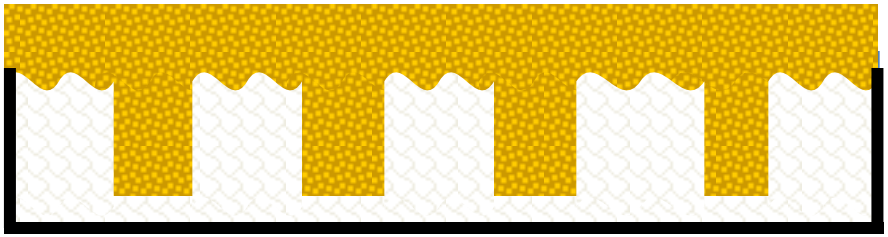
Tooth Structure: ENAMEL



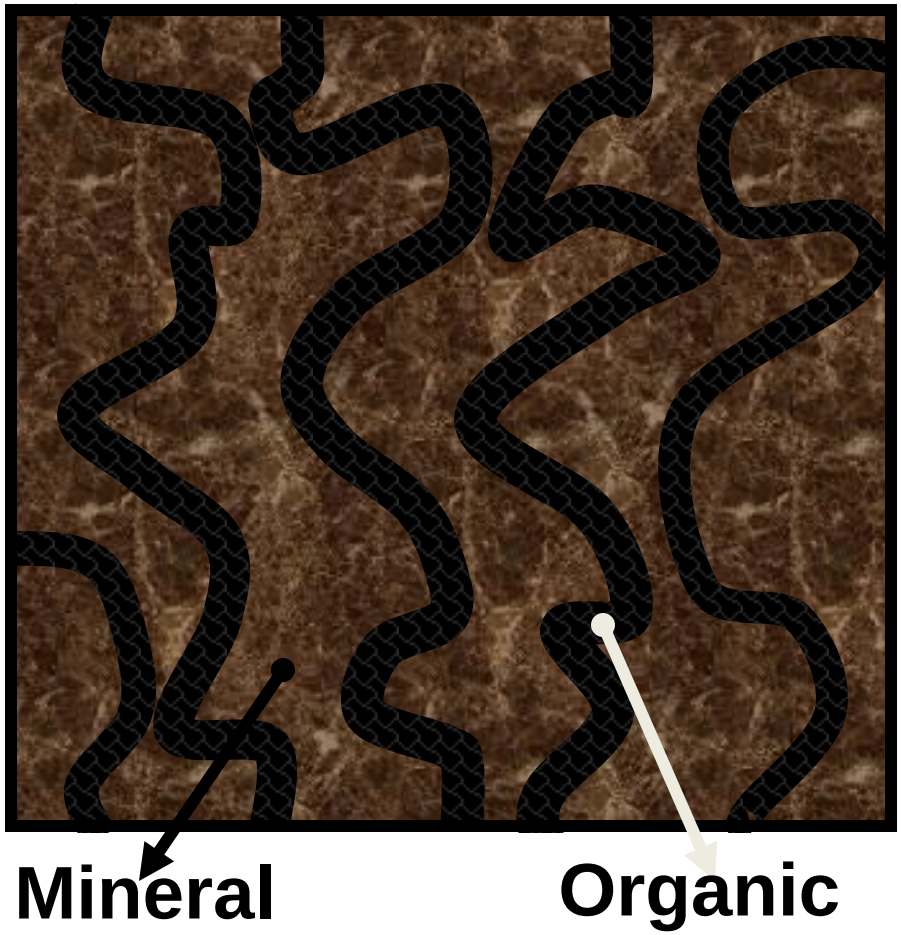
Bonding do Enamel



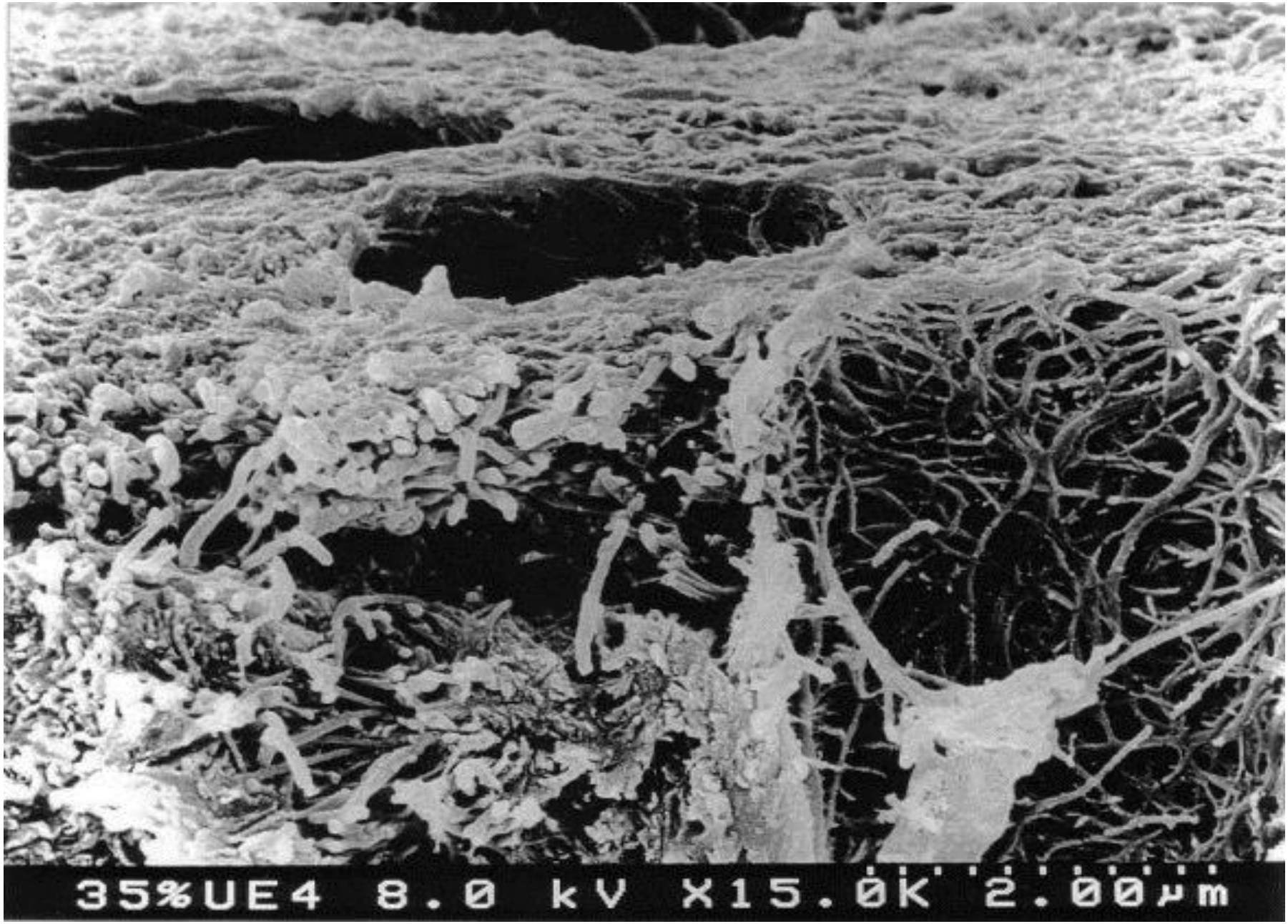


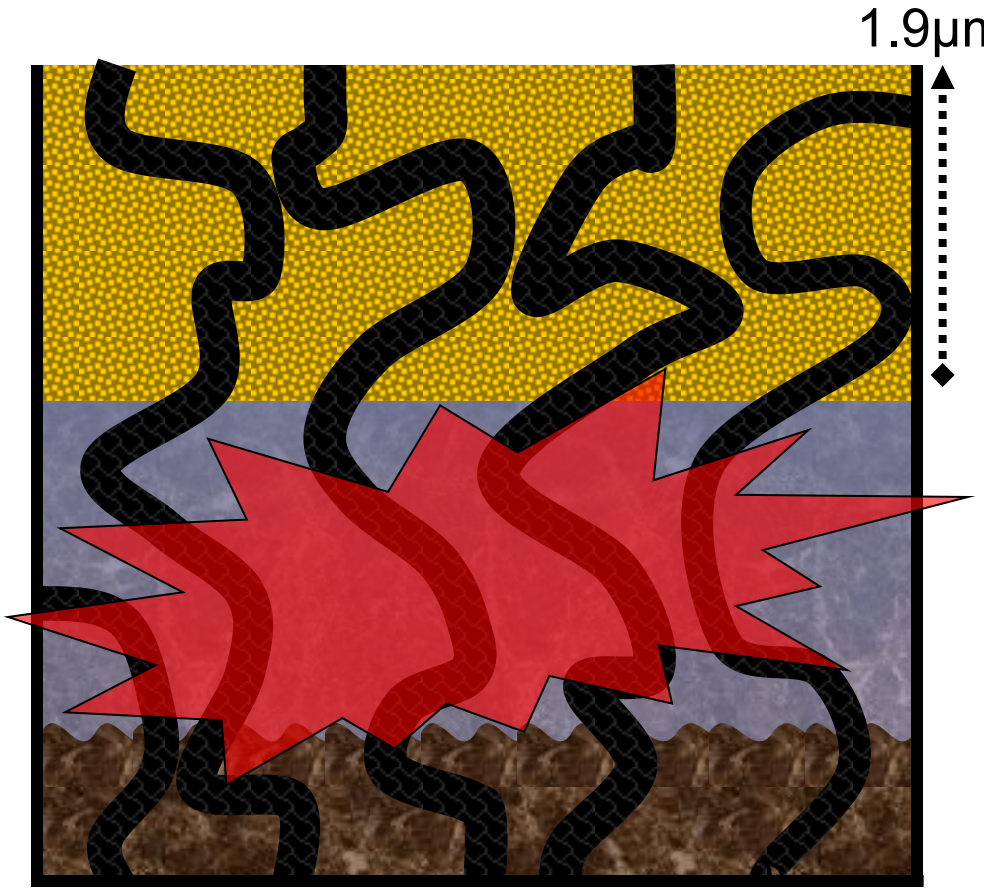


Tooth Structure: DENTIN



Tooth Structure: DENTIN


35%UE4 8.0 kV X15.0K 2.00µm


1.9μm

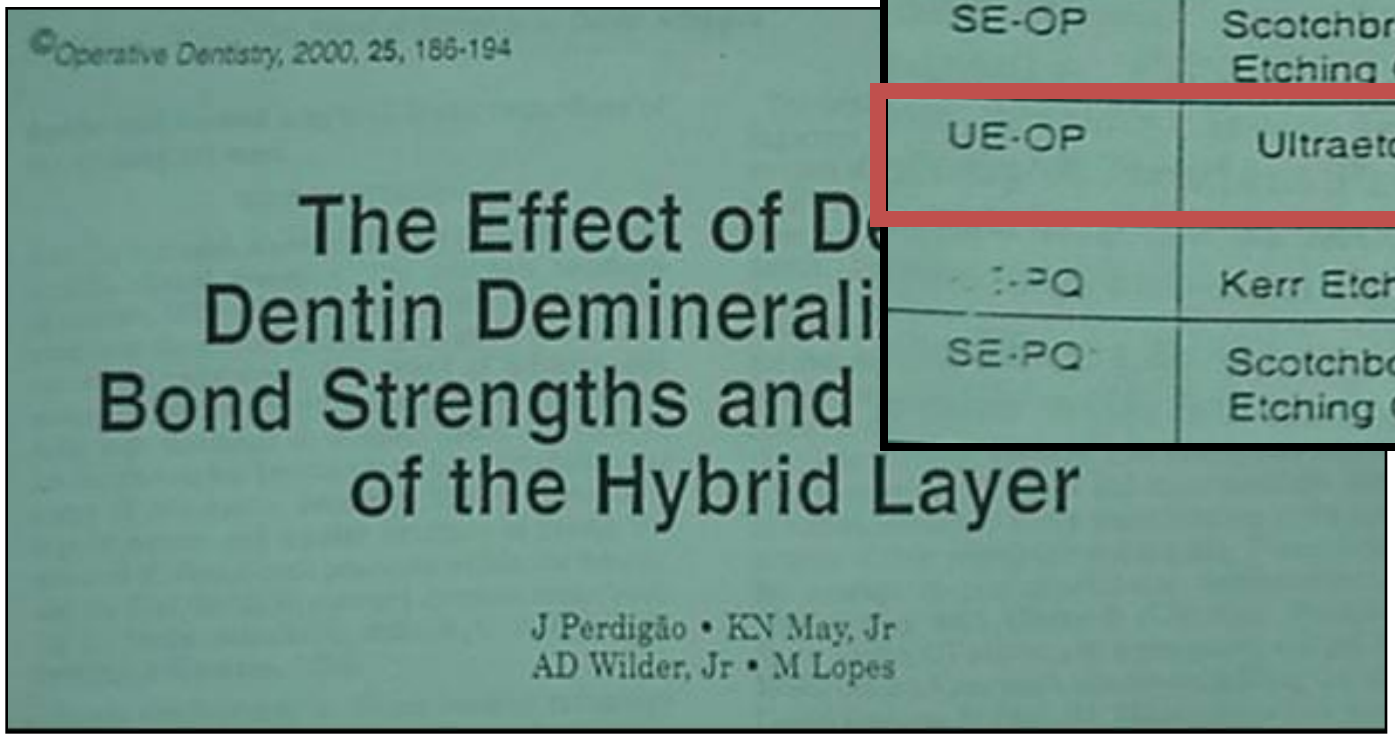
2006
REALITY
Five Star Award
REALITY'S CHOICES

townie choice
townie choice awards.2005

35% Phosphoric Acid

Self Limiting Etch

Group	Etching Gel	Mean deepest intertubular demineralization
KE-OP (**)	Kerr Etchant	5.8 μm
SE-OP	Scotchbrand Etching Gel	3.0 μm
UE-OP	Ultraetch	1.9 μm
KE-PQ	Kerr Etchant	5.8 μm
SE-PQ	Scotchbond Etching Gel	3.0 μm



Bonding to Porcelain

Etching – hydrofluoric acid


Before


After


1 minute


1 minute

BONDING AGENTS

Generations

1st Generation: (1956)

- Glycerophosphoric acid
- DMA Resin
- Resin to tooth
- No longer used (poor clinical results: 1-3 MPa)

2nd Generation: (1970's)

- Unfilled Resin
- Bis-GMA or HEMA
- Ionic bond to calcium
- No longer used (weak bond strength, microleakage)

Generations

3rd Generation: (1980's)

- Etch + Hydrophilic Primer + Unfilled Resin
- Partial removal and/or Modification of smear layer
- Resin did not penetrate through smear layer

4th Generation: (1982)

- Total Etch (Phosphoric Acid) + Primer + Adhesive
- Complete removal of smear layer
- "Wet bonding" (risk of being too wet or dry)
- Formation of hybrid layer and resin tags
- Good clinical results

Generations

5th Generation: (1990's)

- Total Etch + Adhesive
- Hydrophilic monomers
- Formation of hybrid layer and resin tags

6th Generation: (late 1990's – 2000)

- Self-etching primer + Hydrophobic adhesive
- Partial removal of smear layer
- Chemical instability of primer

7th Generation: (2000's)

- One bottle
- Partial removal of smear layer
- Chemical instability

7th Generation Bonding (all in one)

Shampoo

+

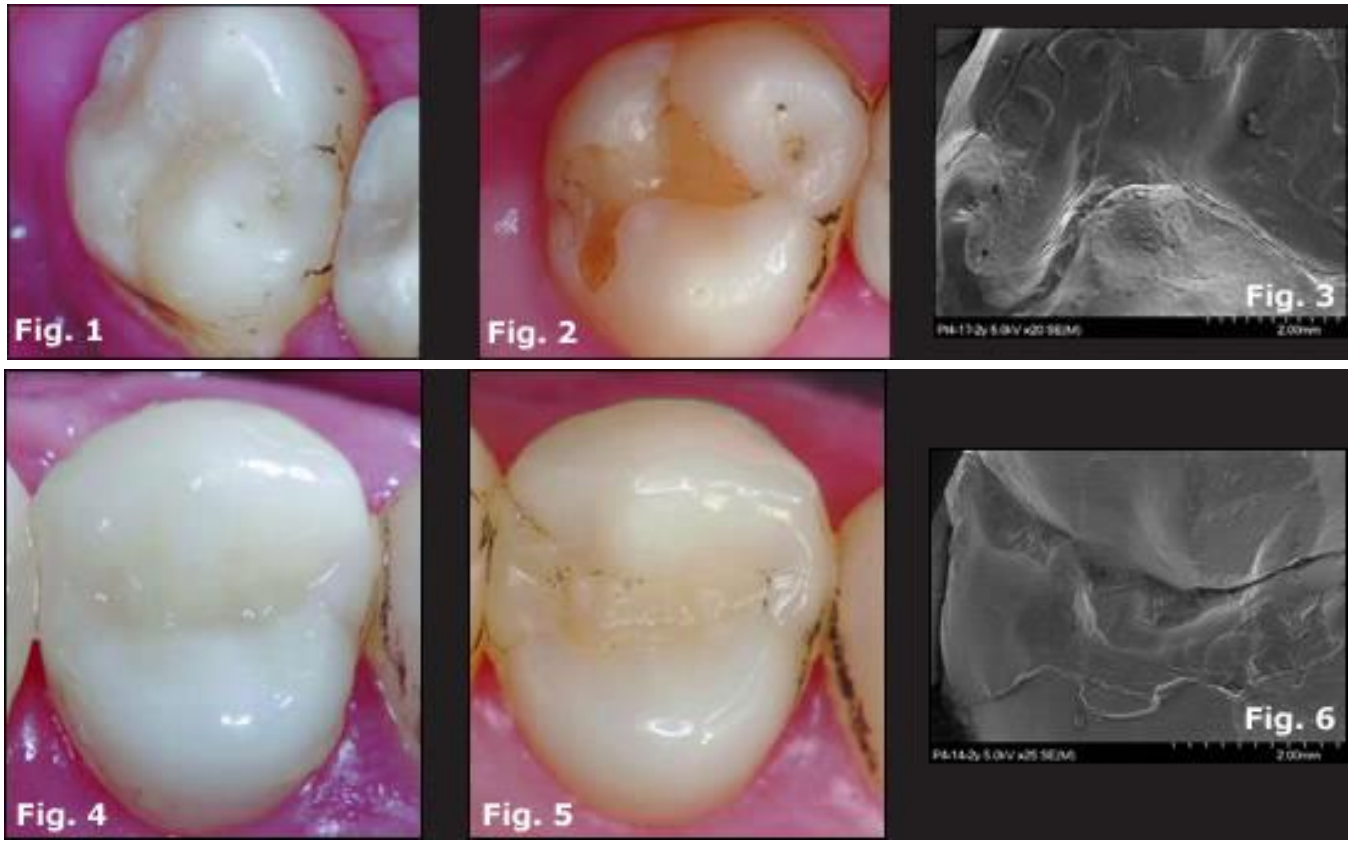
Rinse

+

Conditioner

or…

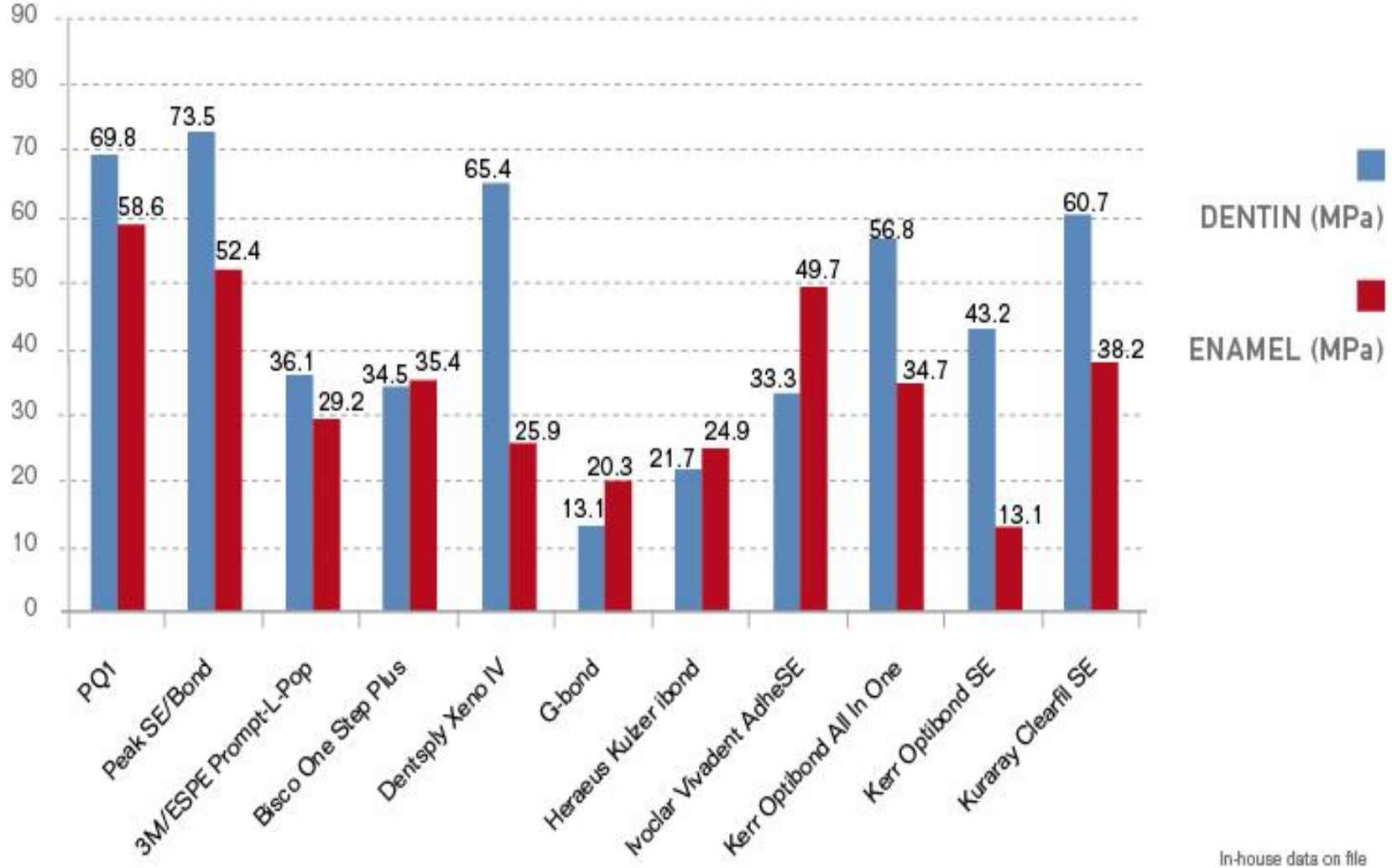
7th Generation Bonding (all in one)



Perdigão J, Dutra-Corrêa M, Castilhos N, Carmo ARP, Anauate-Netto C, Cordeiro HJD, et al. One-year clinical performance of self-etch adhesives in posterior restorations. Am J Dent. 2007 Apr; 20(2):125-33

24-hr. Dentin vs. Enamel Shear Bond Strengths in MPa

PEAK SE PRIMERS AND PEAK BOND RESIN



In-house data on file

Variables Which Affect Quality Of Bonding

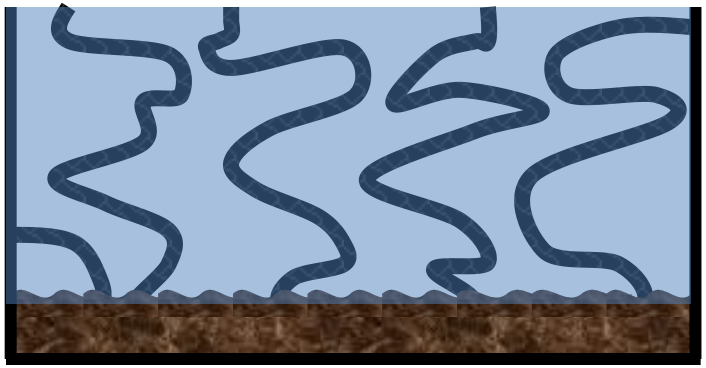
1) Etching

Etching too long can etch too deep, making it difficult for the resins to reach sound tooth structure.

Variables Which Affect Quality Of Bonding

2) Drying dentin

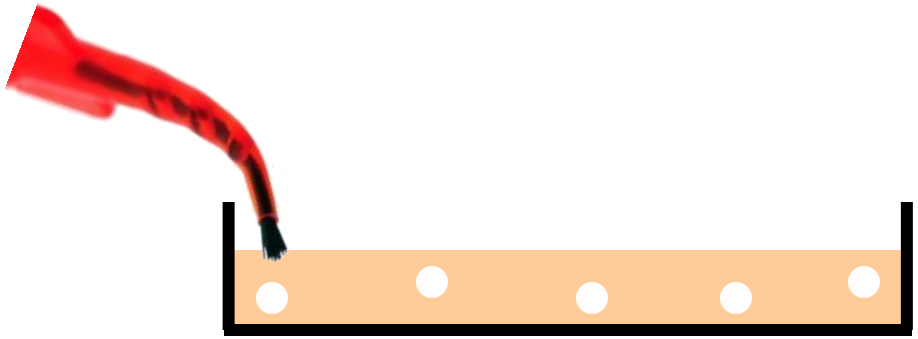
Over drying the dentin after etching can be very destructive to bond values with some adhesives.



Variables Which Affect Quality Of Bonding

3) Application time

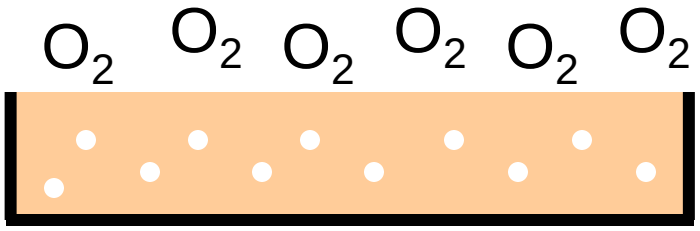
Too short of application time may not allow for proper volatilization of the solvents or complete resin hybridization. This is critical with self etching systems.



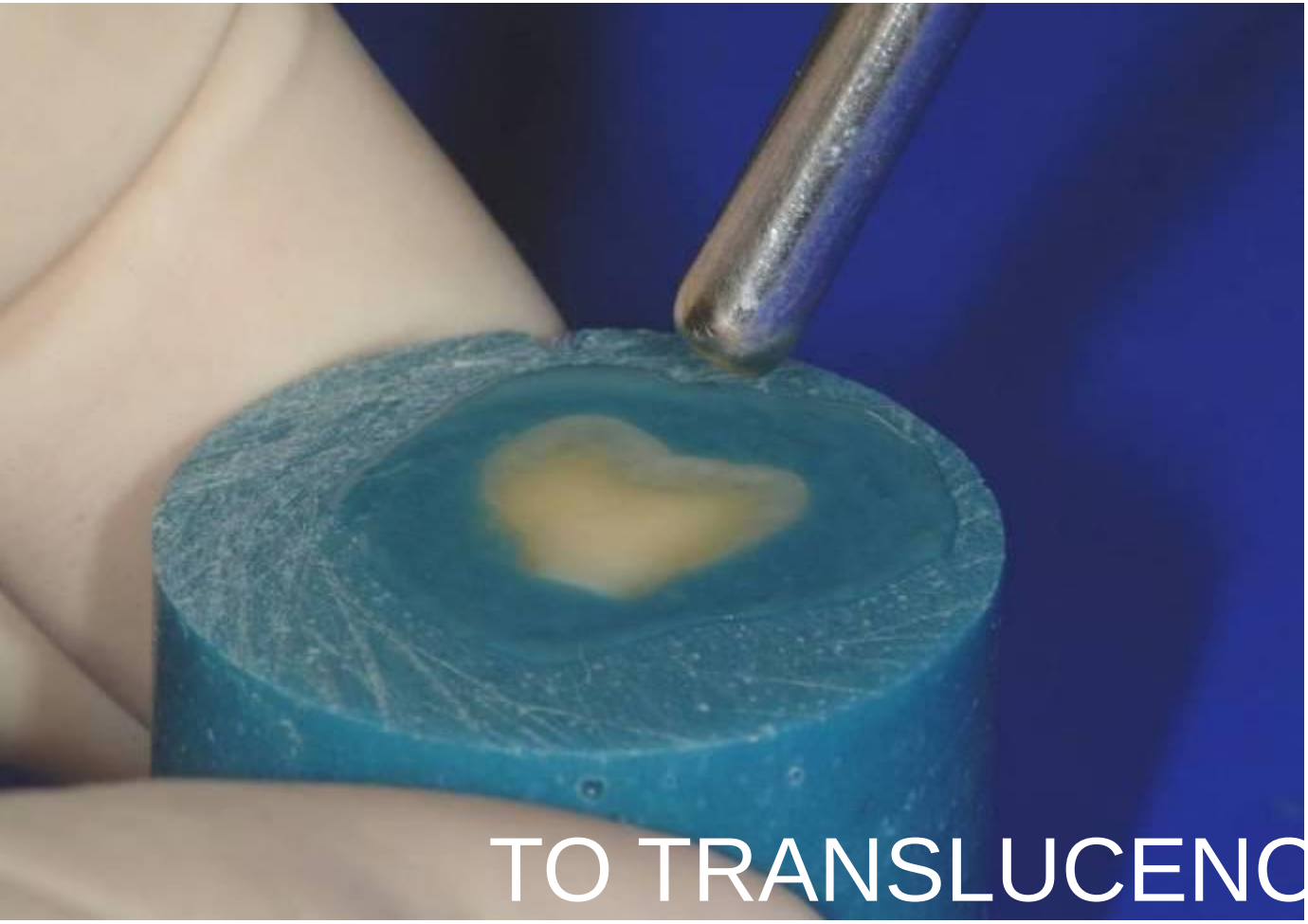
Variables Which Affect Quality Of Bonding

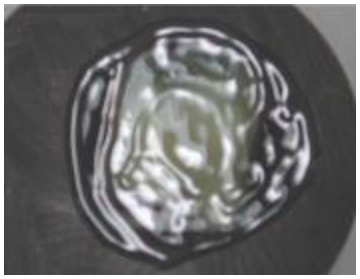
4) Thinning / drying

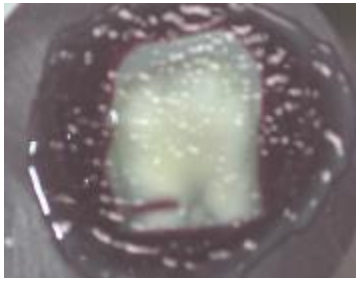
Too thin of adhesive layer doesn't allow for proper curing due to oxygen inhibition. Too thick and the adhesive may still contain solvents.



Air thin / Dry







Variables Which Affect Quality Of Bonding

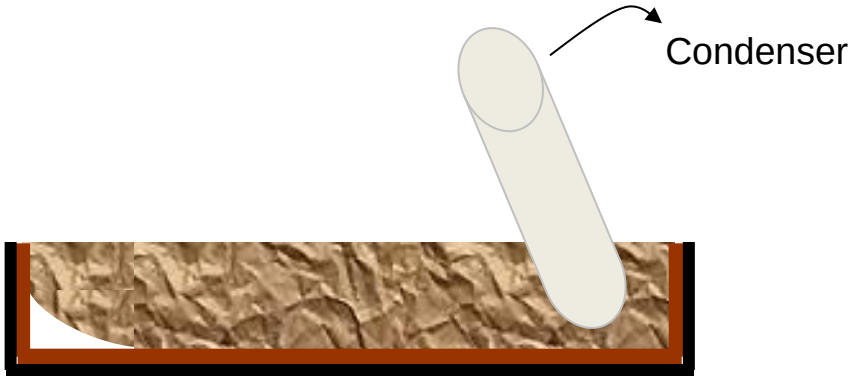
5) Light curing

Too short or insufficient light cure equals partially polymerized resins.

Variables Which Affect Quality Of Bonding

6) Composite Placement

Improper adaptation of the composite to the adhesive can create voids at the bonding interface.



Variables Which Affect Quality Of Bonding

7) Contamination

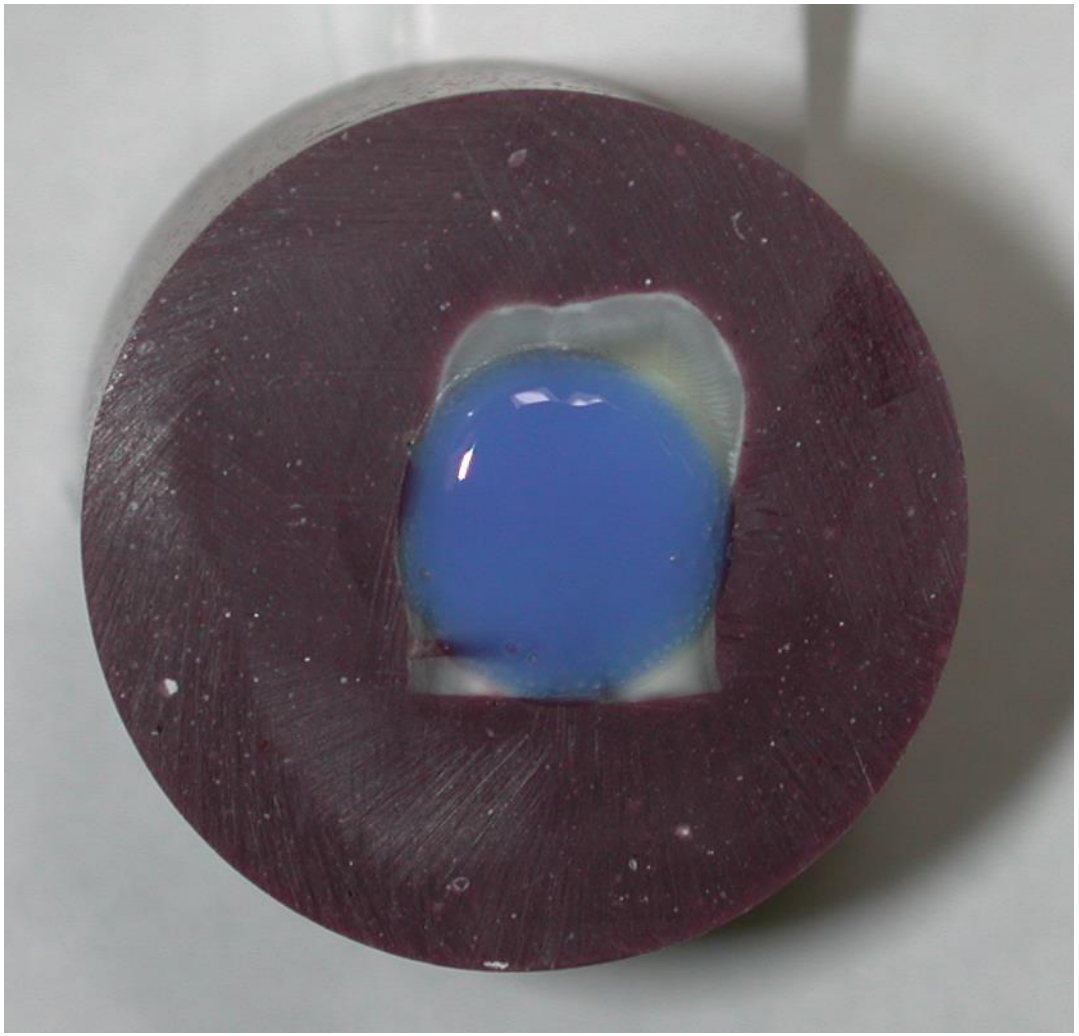
- **Blood**
- **Sulcular fluid**
- **etc…**

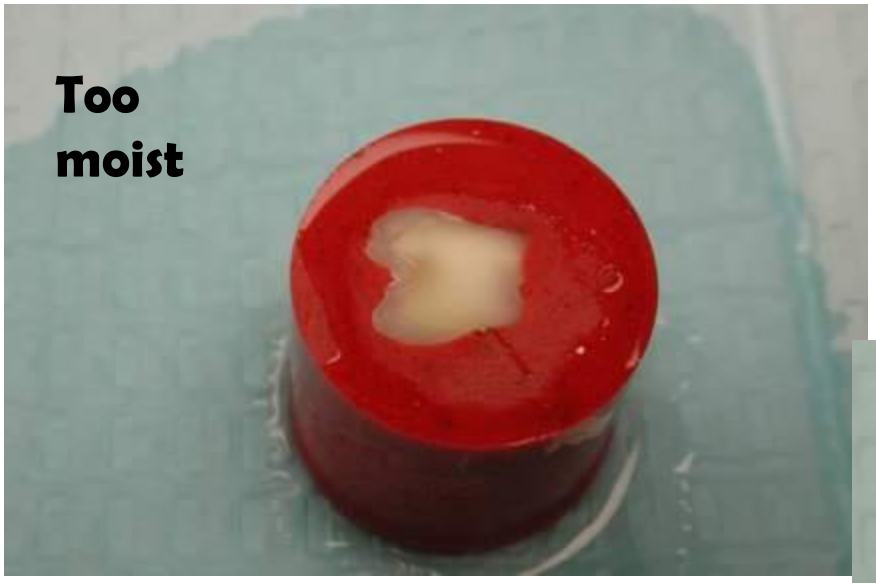
Variables Which Affect Quality Of Bonding

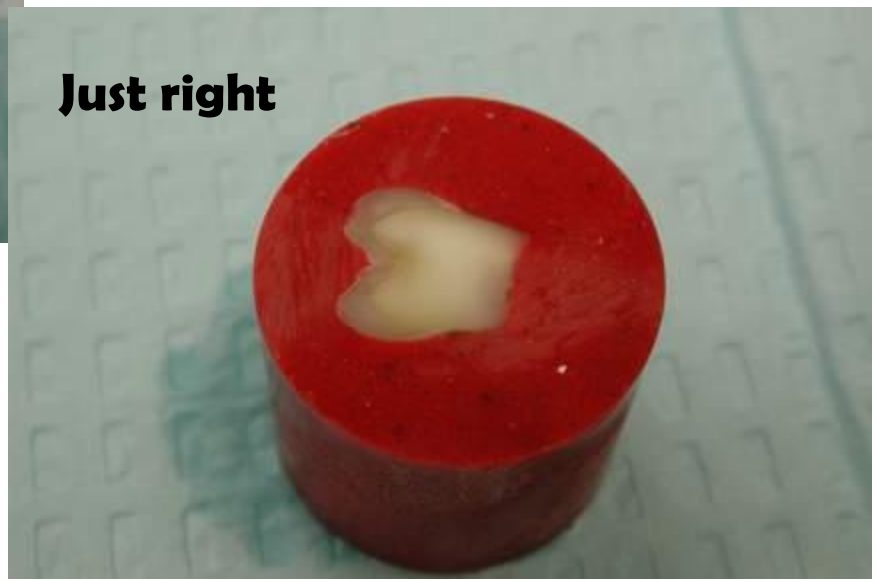
8) Deteriorated product

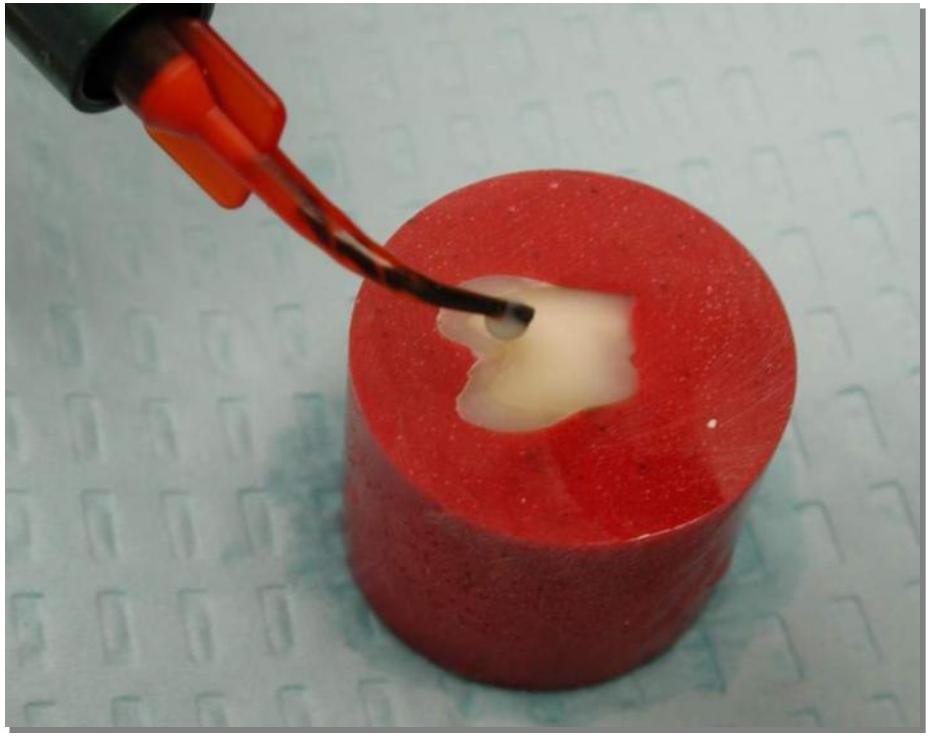
- **Expired**
- **Volatilized**

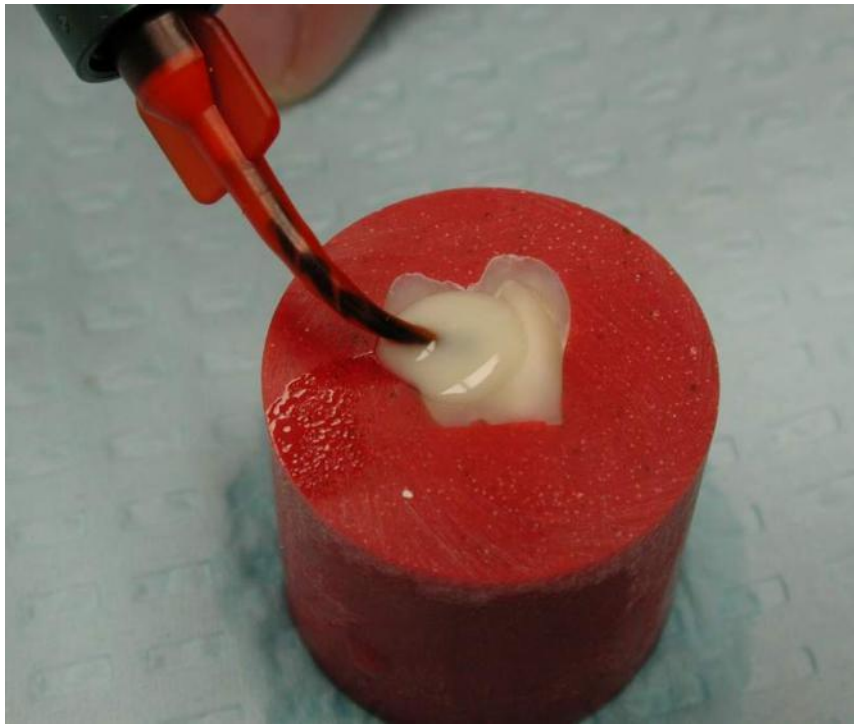

Bond Testing

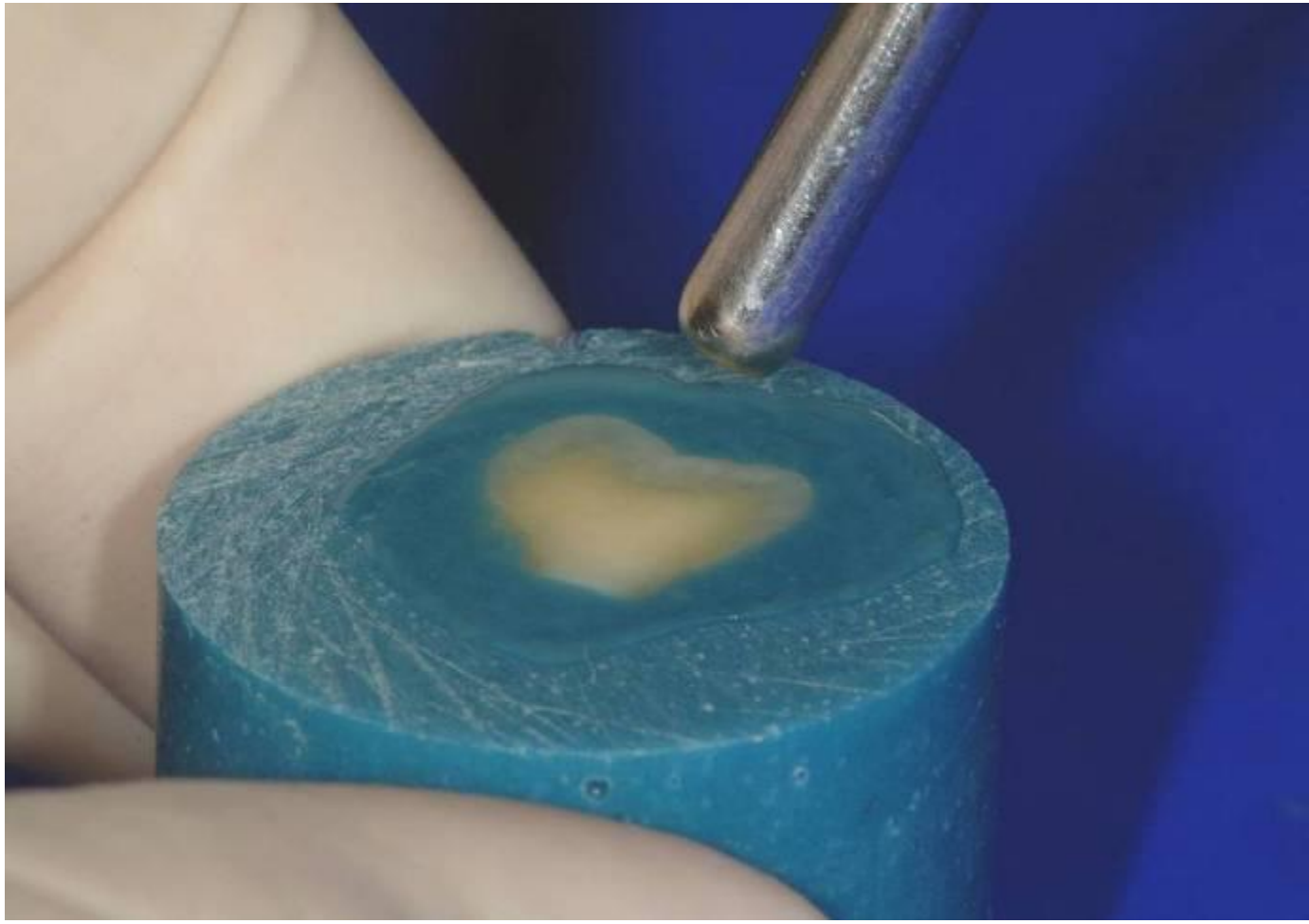


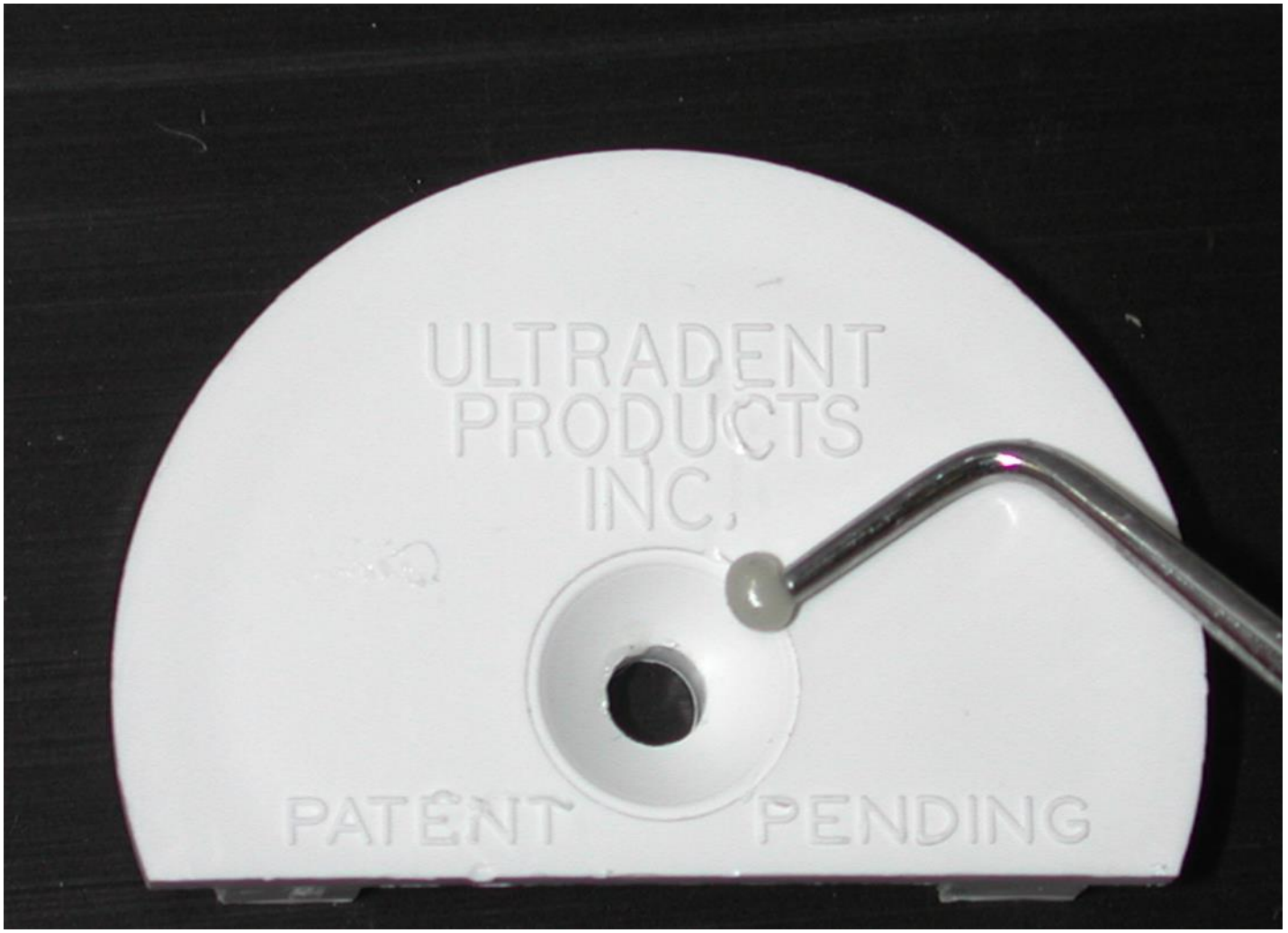

Too
moist

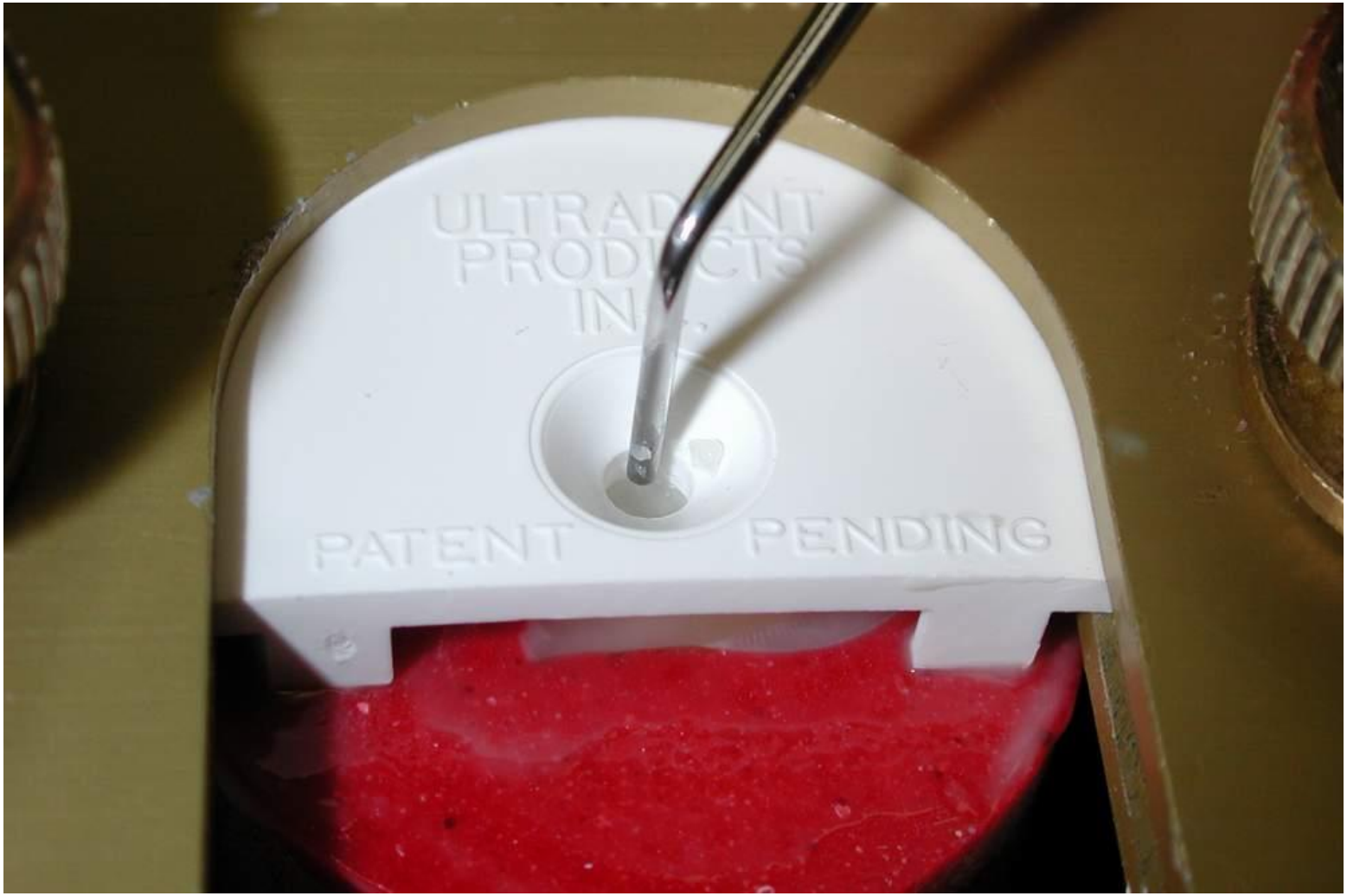

Just right

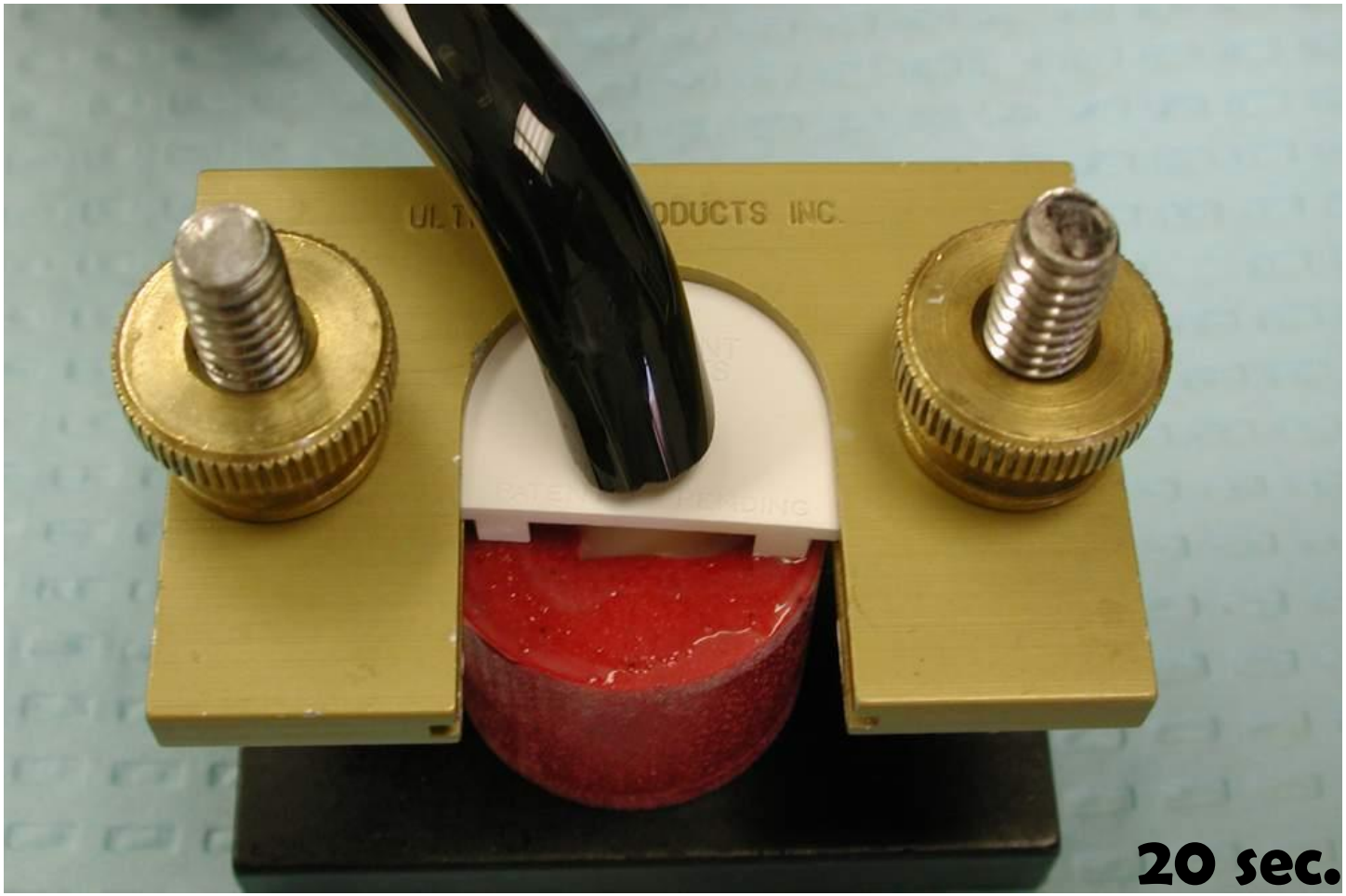







ULTRADENT
PRODUCTS
INC.
PATENT PENDING


PATENT PENDING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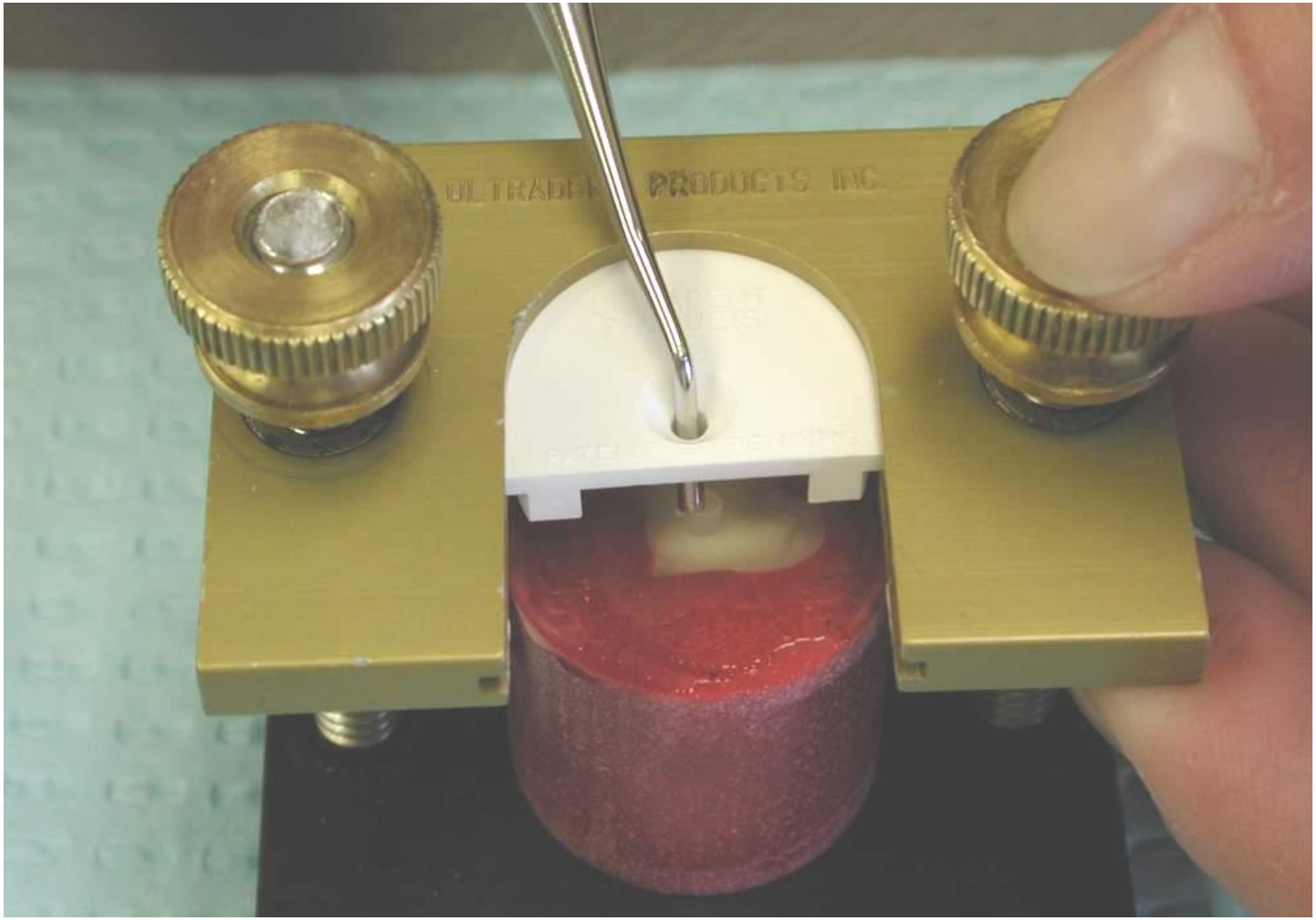
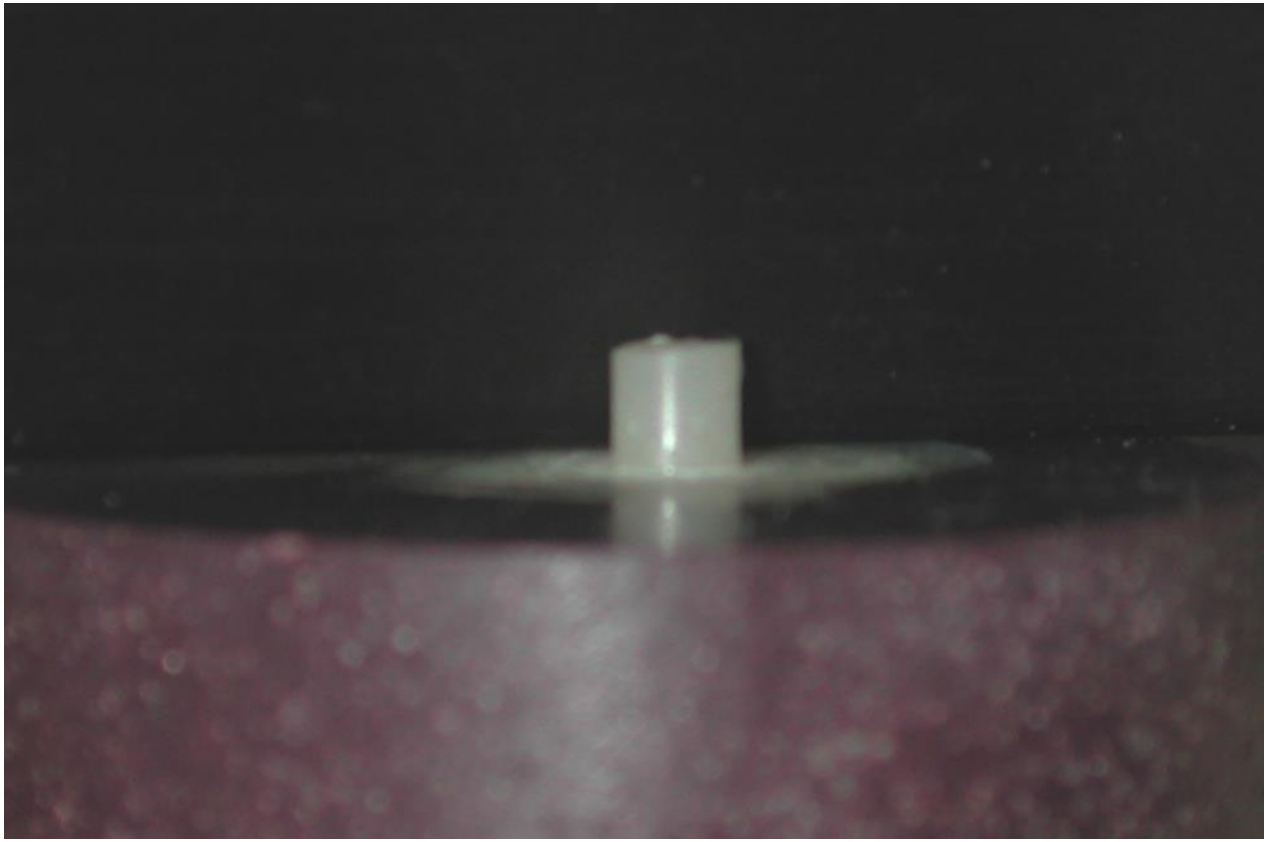
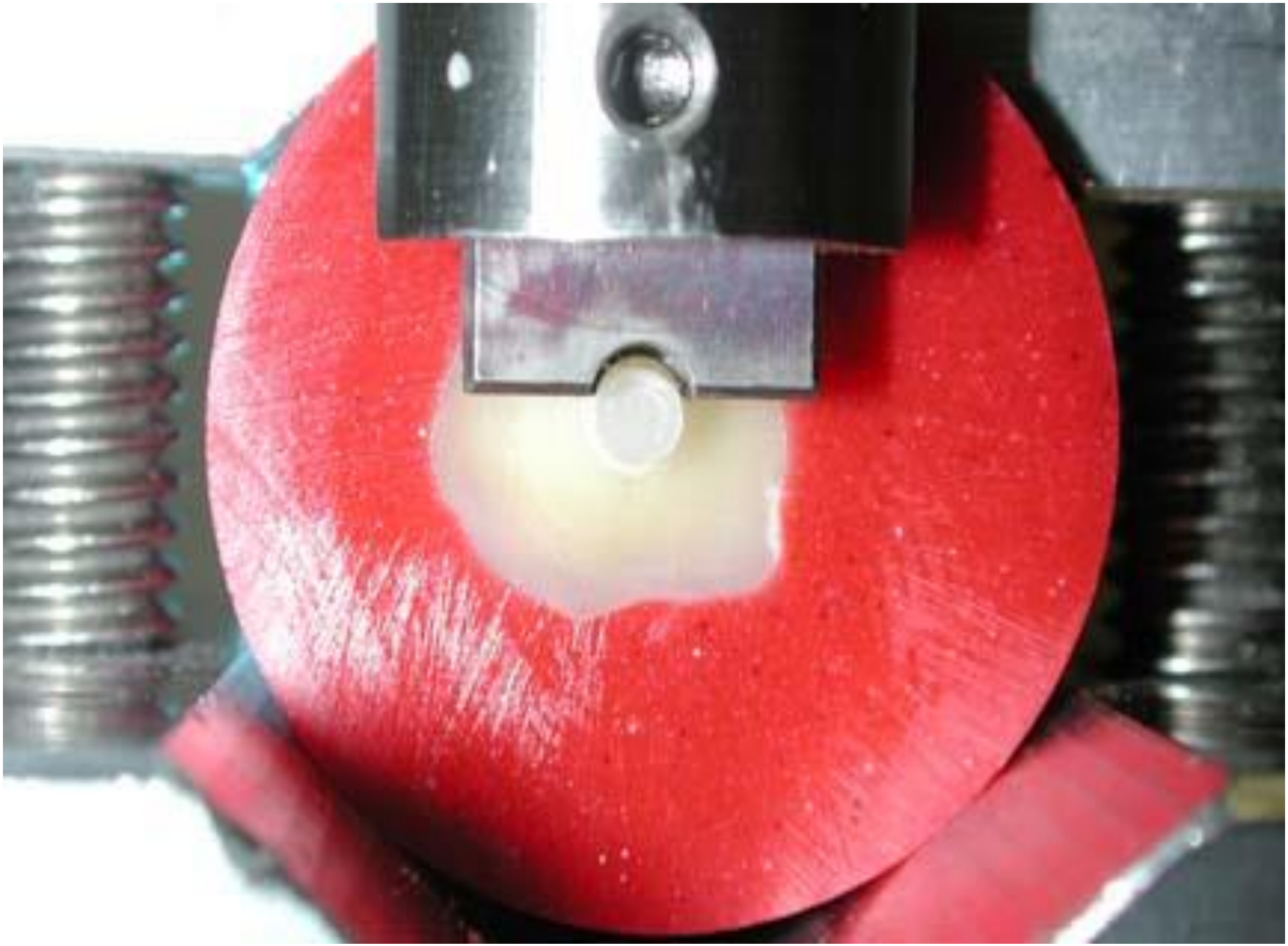
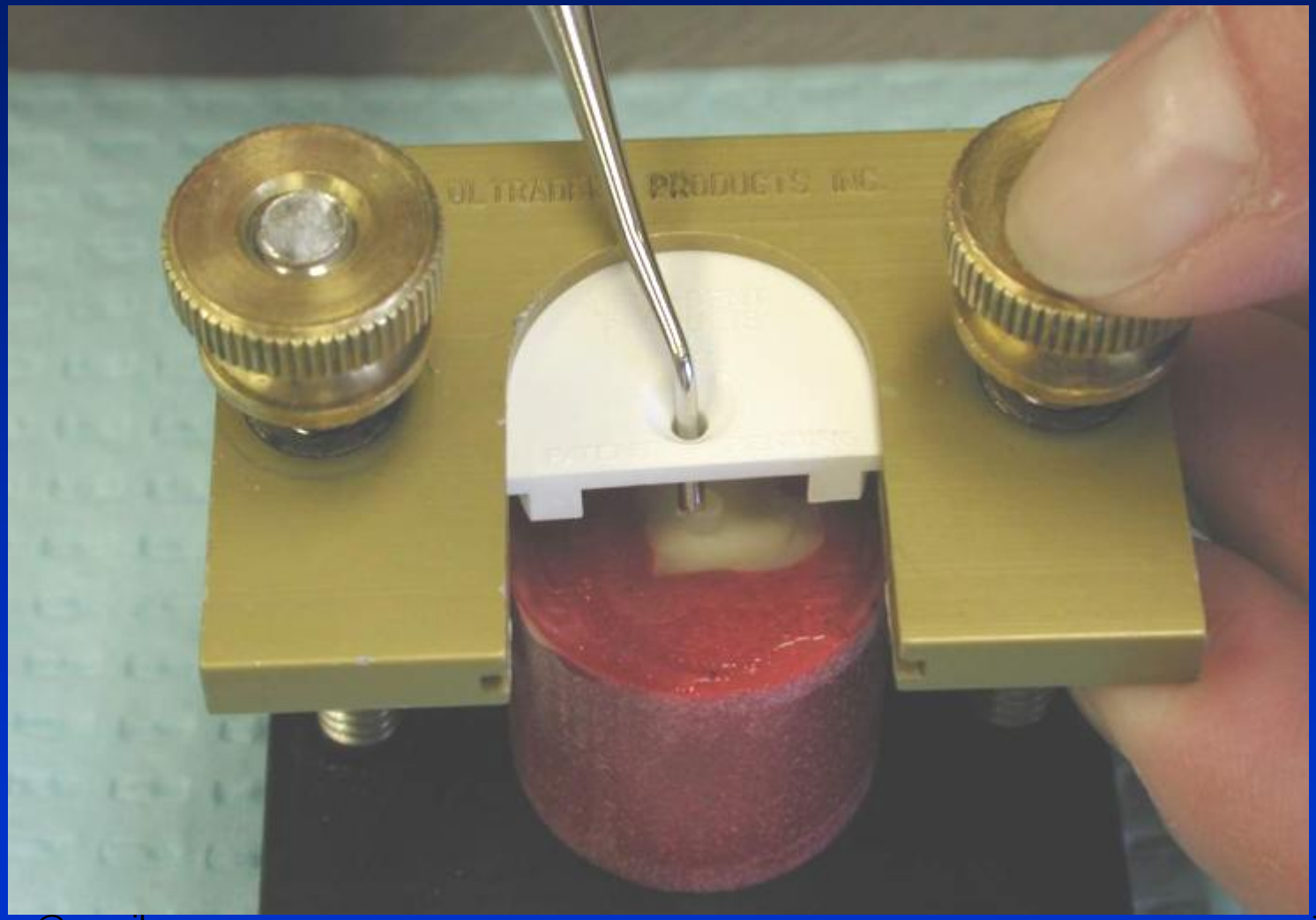
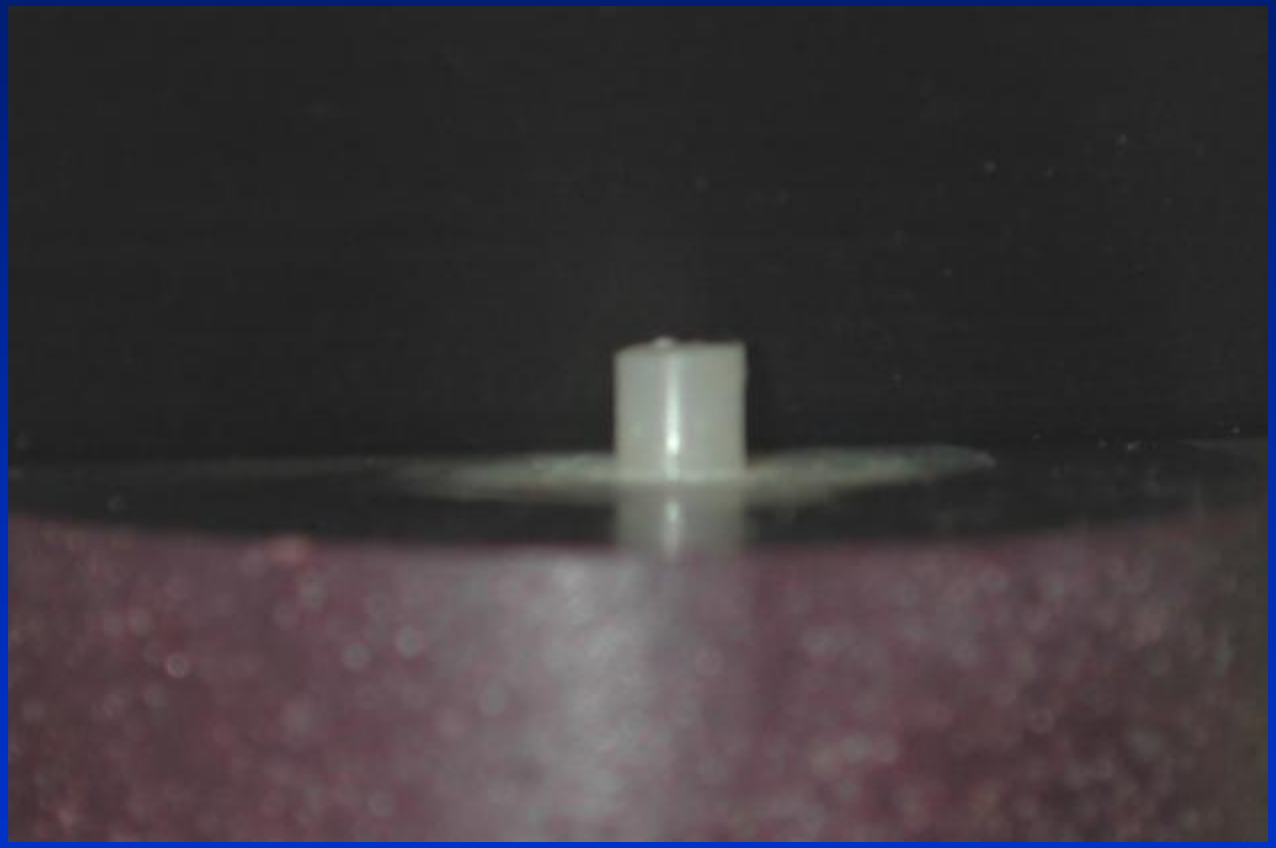
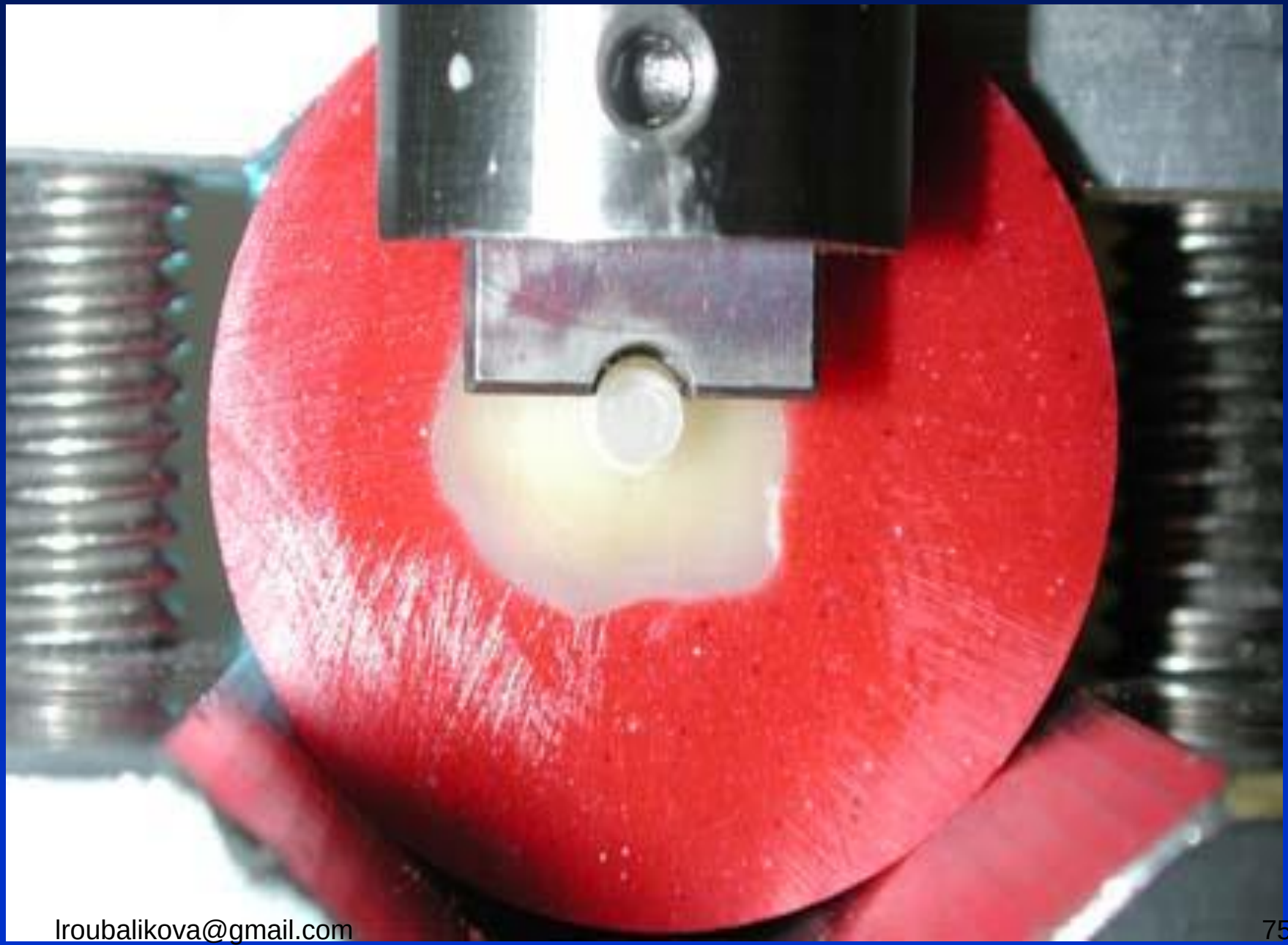




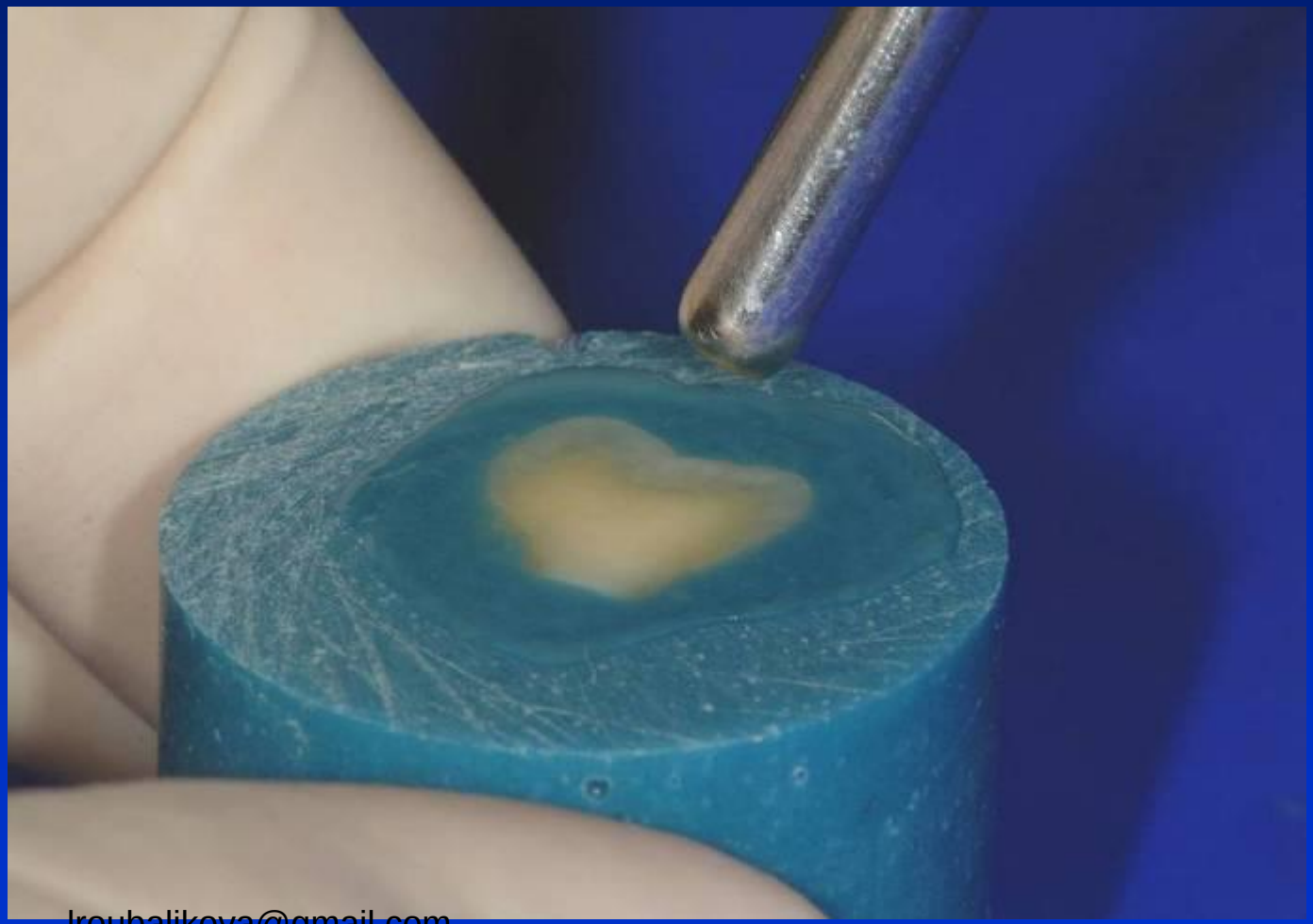


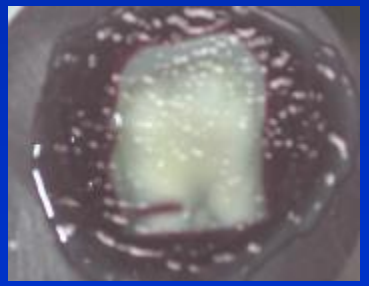






Kdy máme správně nabondováno?

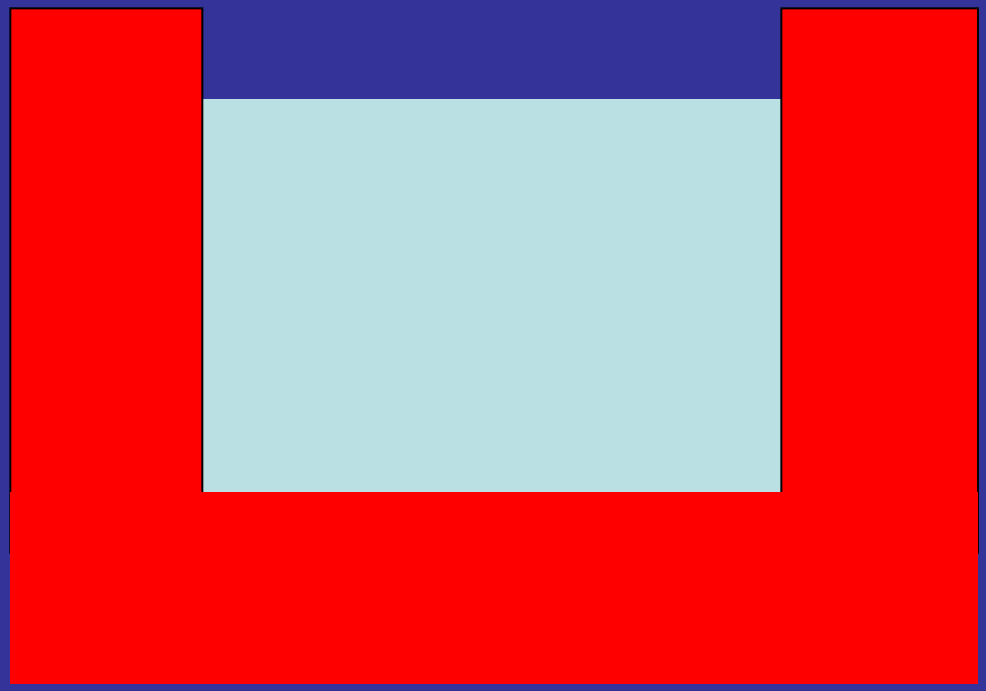




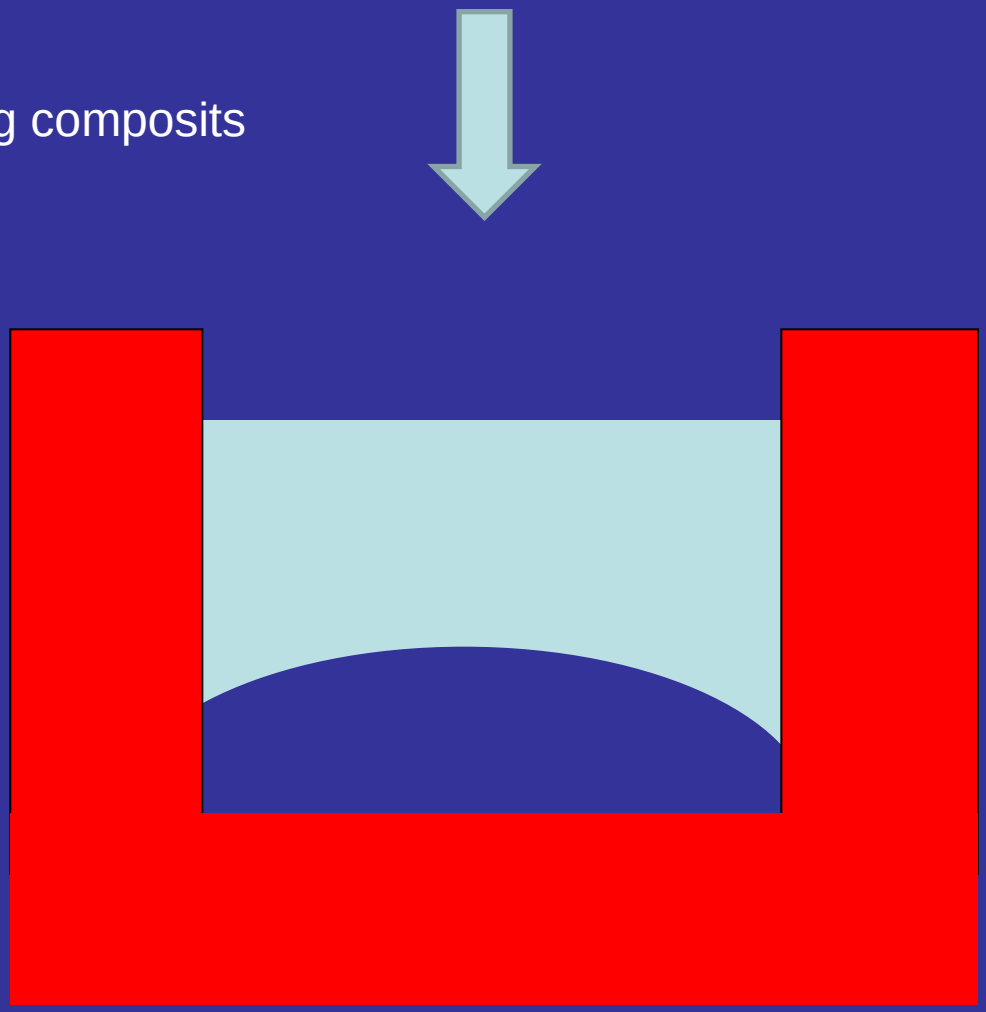
Polymerization shrinkage

Towards light source ?

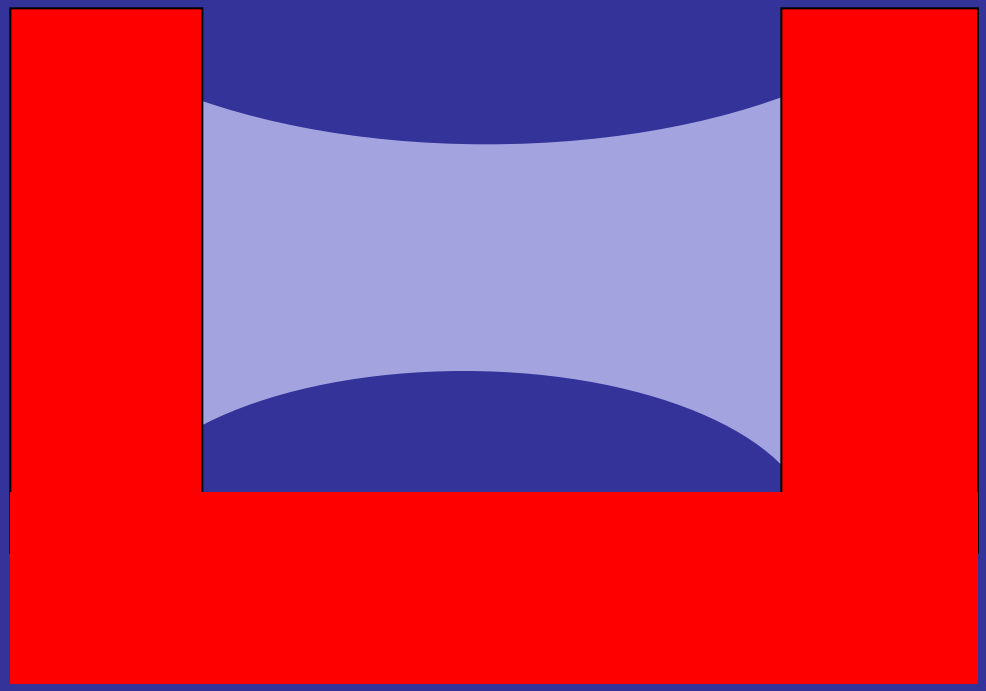
Ligth curing composits



Ligth curing composits



Selfcuring composits



Polymerization stress depends on

Material

C - factor

Mode of application

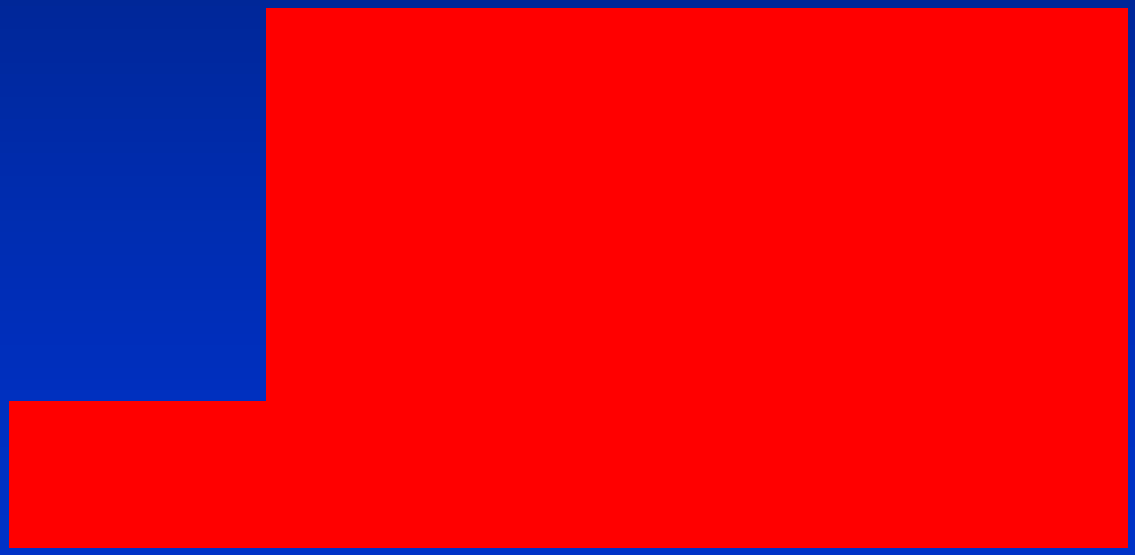
Mode of polymerization

Polymerization

Continual polymerization
Min. 500 mW/cm^2 40 s

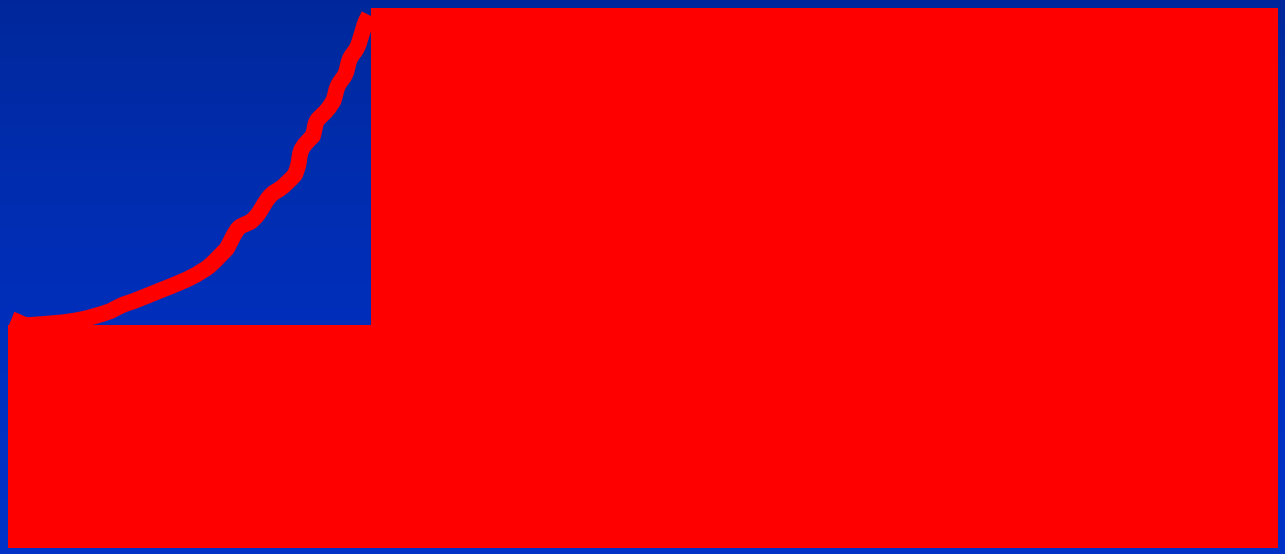
2 step polymerization

10 s cca 140 mW/cm² *750 mW/cm² 30 s*



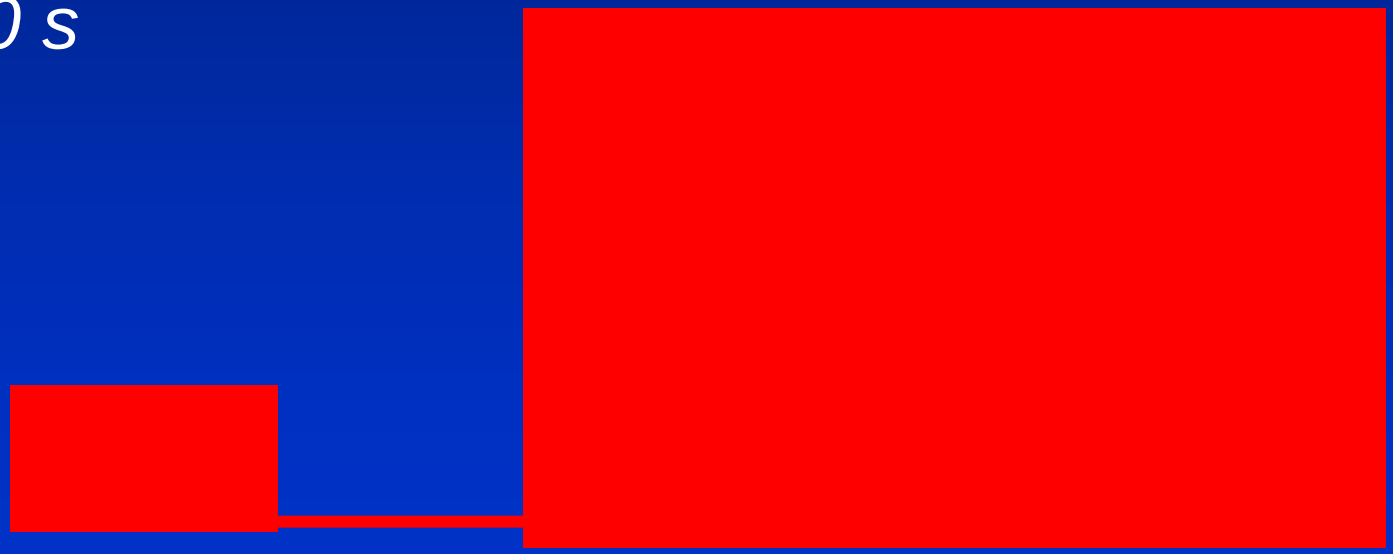
Soft start

Continuos increasing to 750 mW/cm^2 during 10 s and polymerization 30s



2 step polymerization with interruption

100 – 300 mW/cm^2 3-5 s, přerušoi na 3 min, pakpolymerovat 750 mW/cm^2 po 30 s



Polymerization units

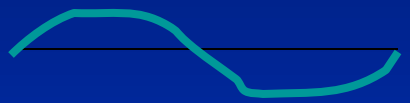
Quartz Tungsten Halogen (QTH)

- Plasma – Arc (PAC)
- Light Emitting Diode (LED)

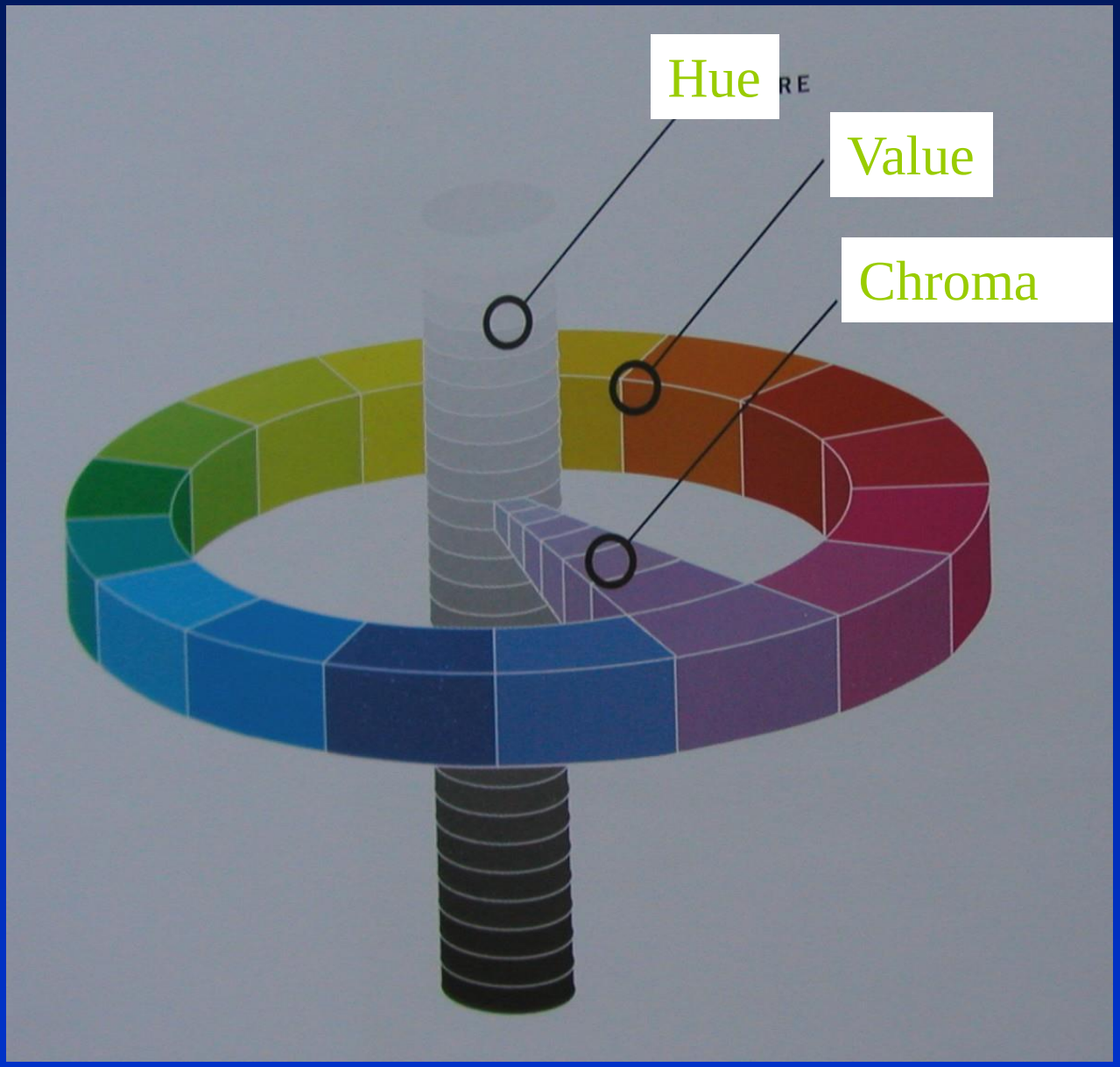
Light

- Electromagnetic radiation

-Wavelength
-Amplitude
Photons



Beam
- **Reflection**
- **deflection**

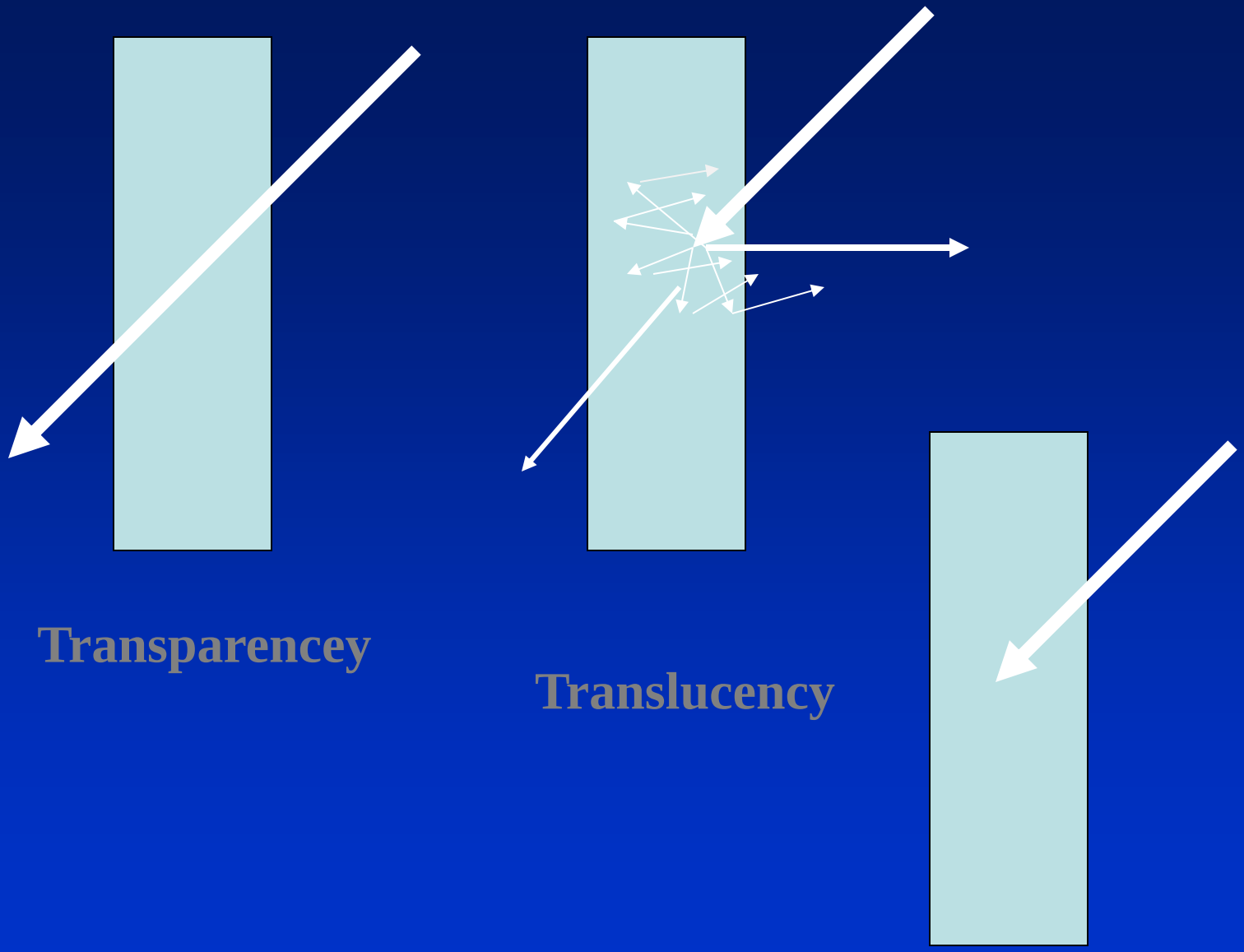


3variables

Chroma – wavelength

Hue – amplitude

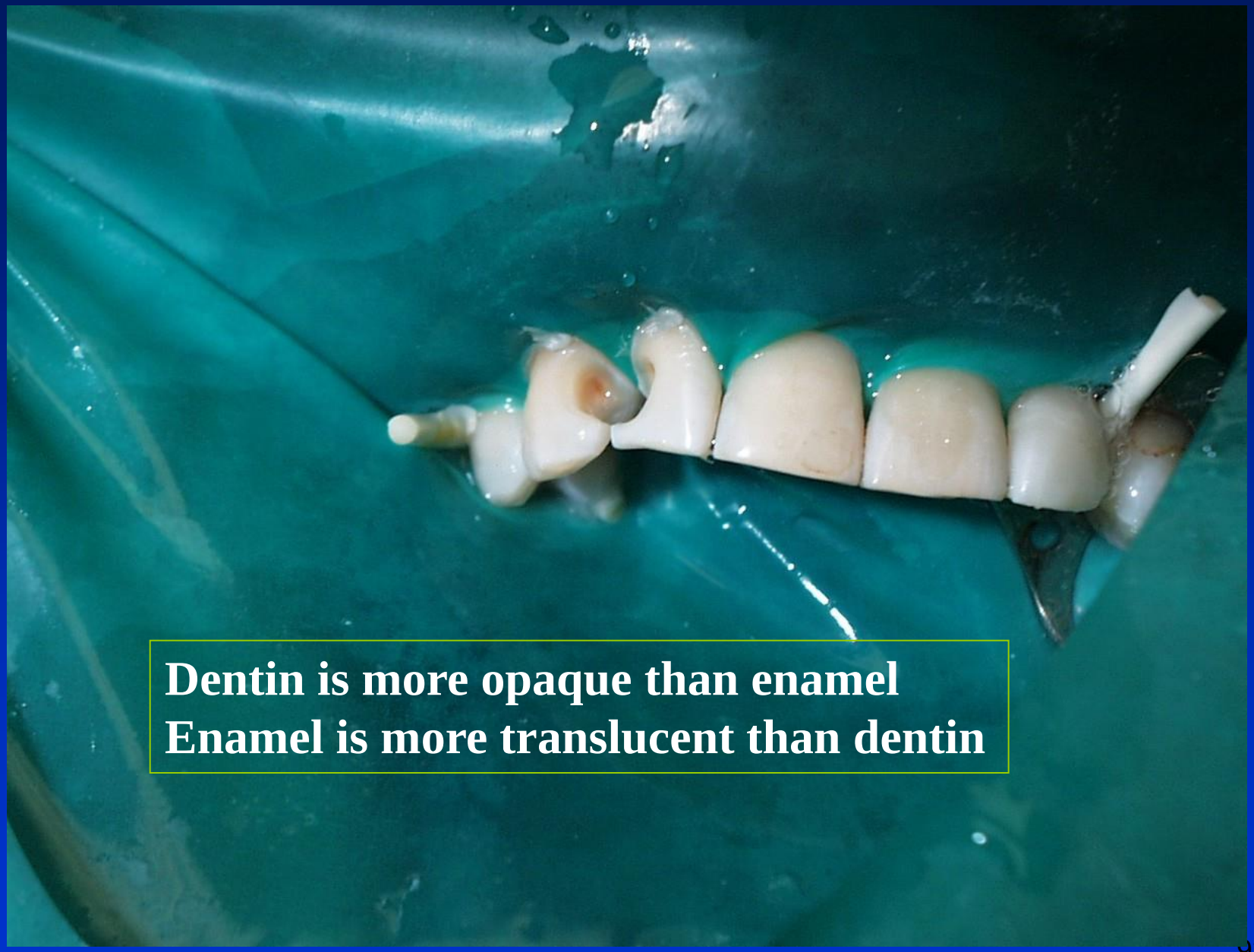
Value - cleanliness



Transparencey

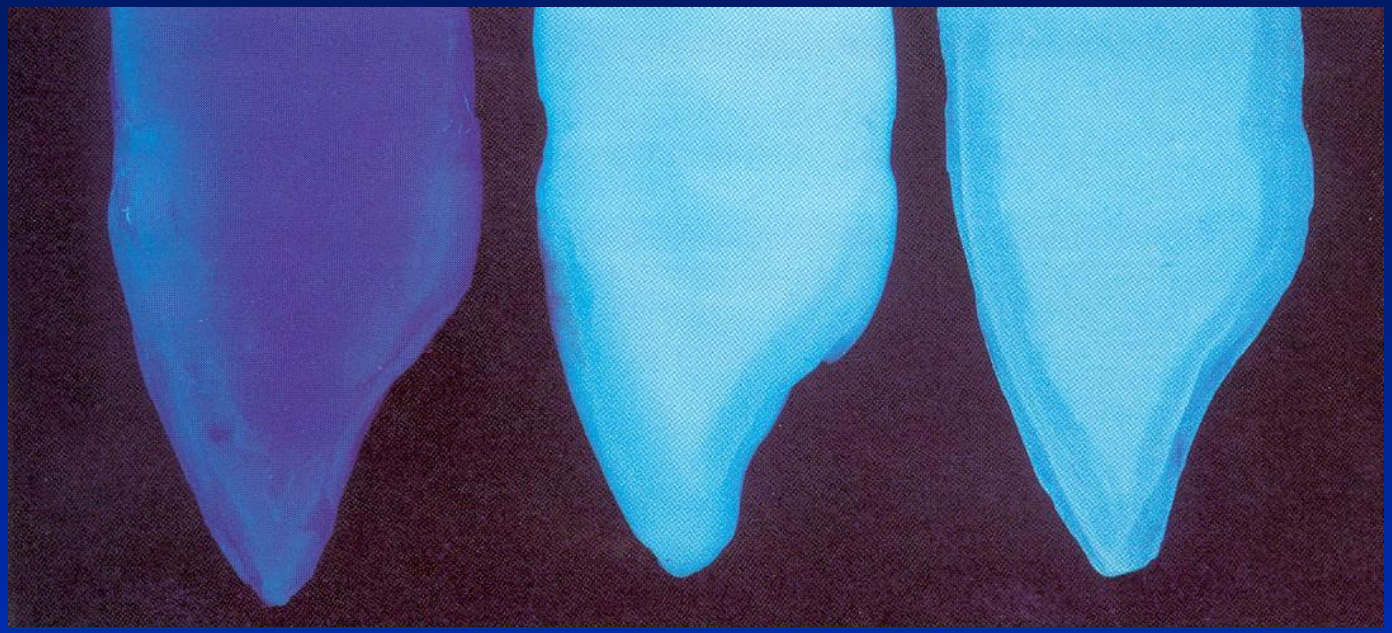
Translucency

Opacity


Dentin is more opaque than enamel
Enamel is more translucent than dentin

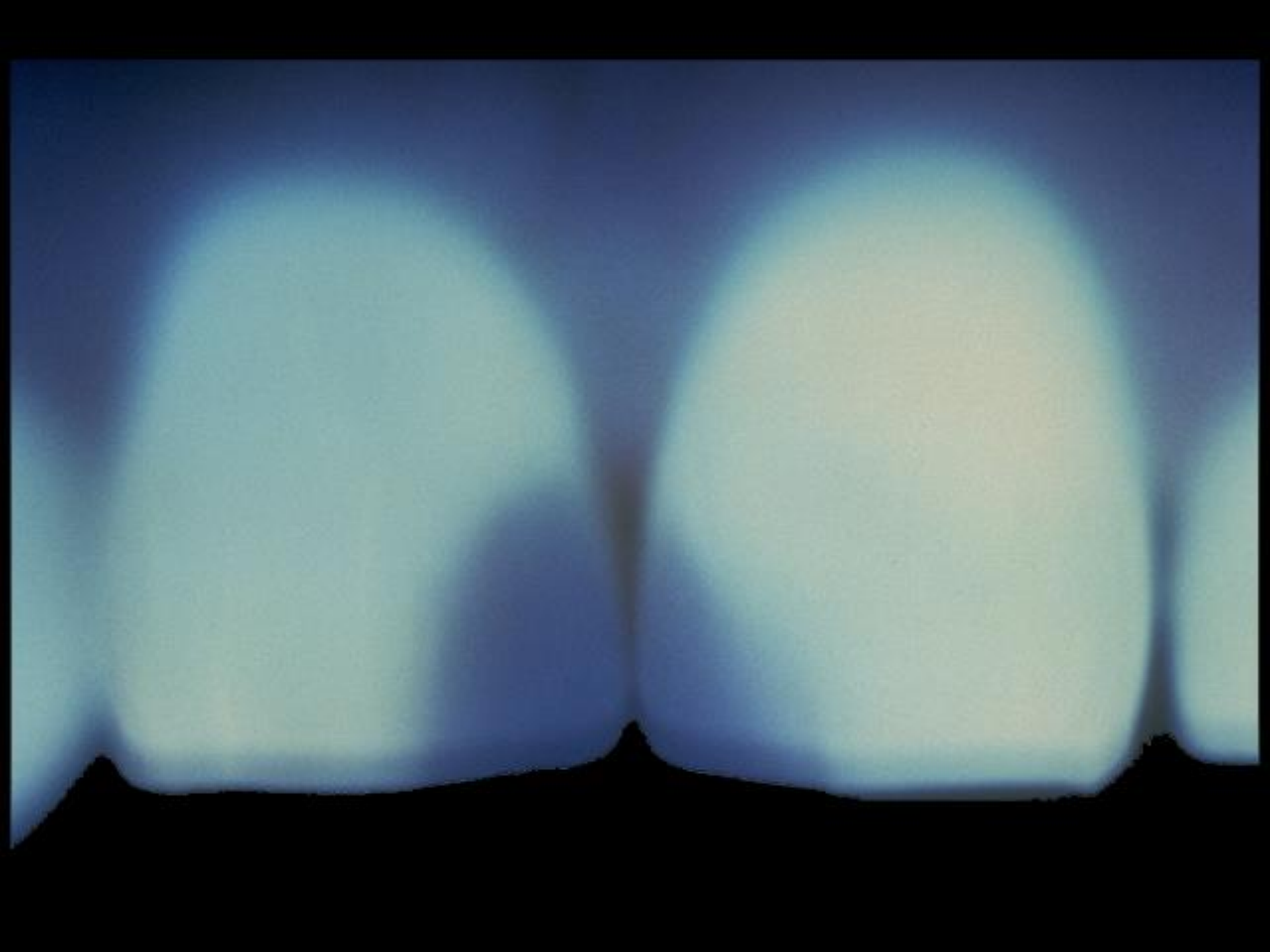
1	2	3
Old	Middle age	Young

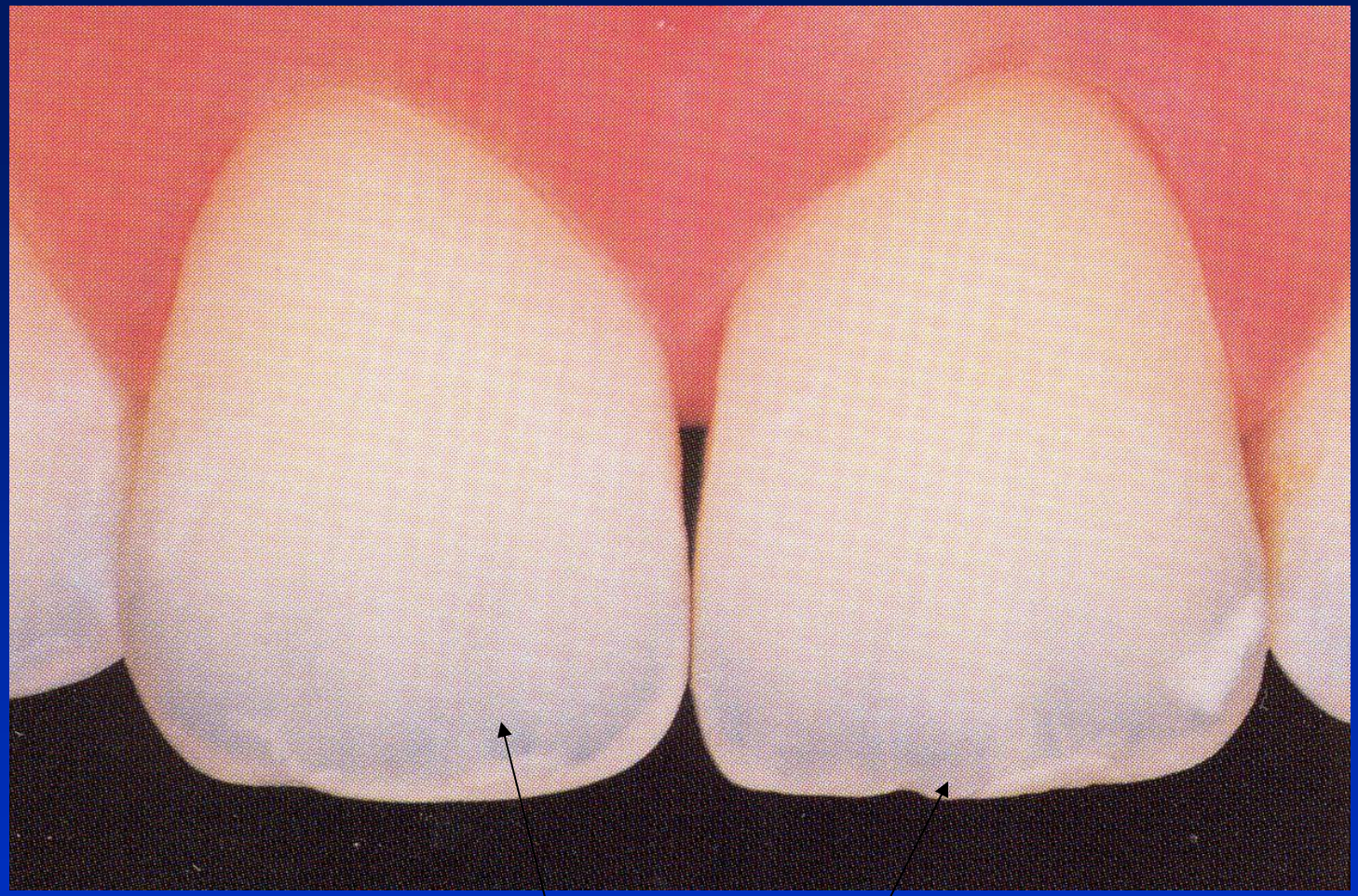
Translucency



Fluorescency

Absorption of light and irradiation back – different wavelength
Absorption ultraviolet – irradiation blue
In dark room – teeth are bright and white after comming from sunny light

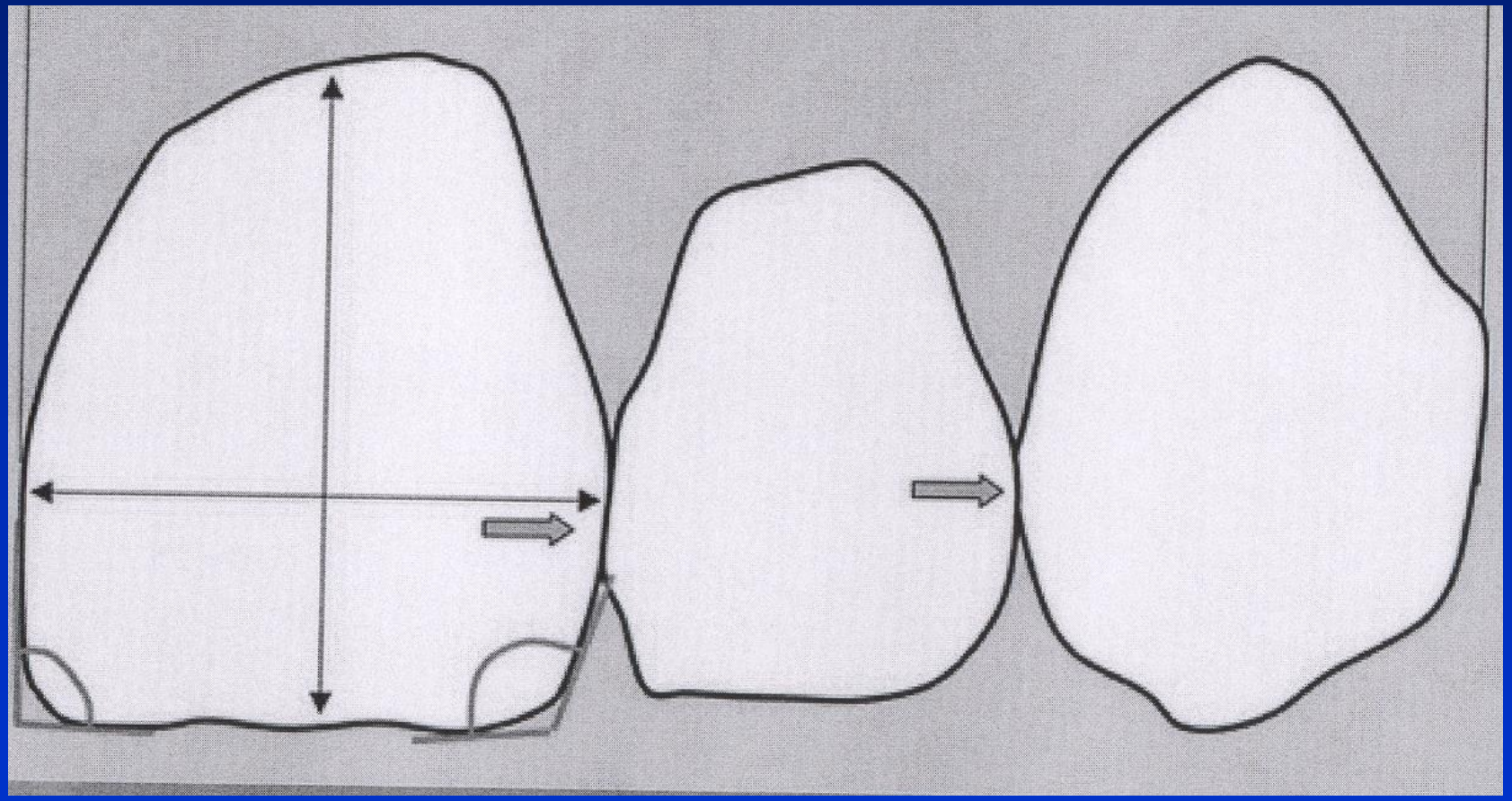


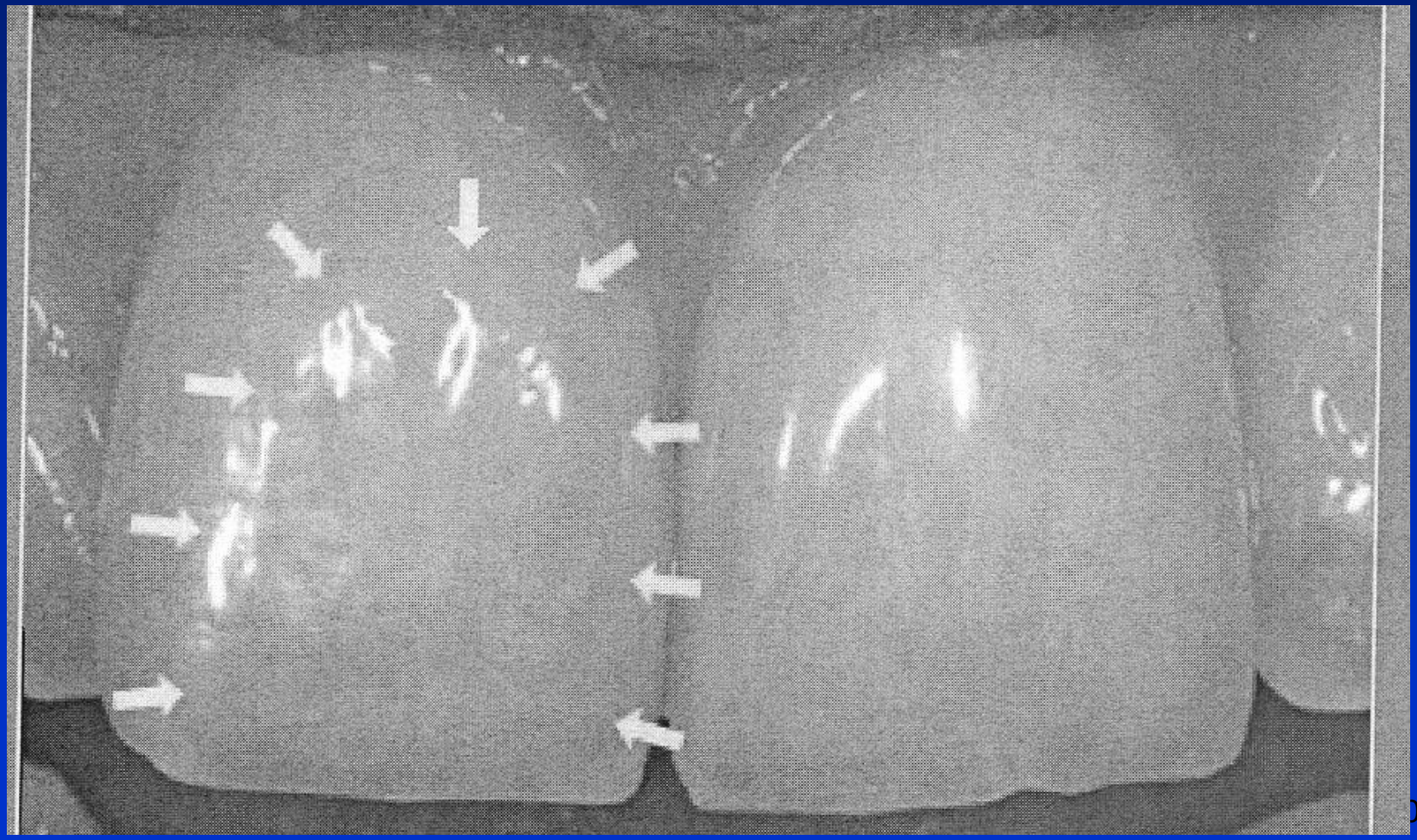


Opalescency – blue or grey colour up to incisal edge

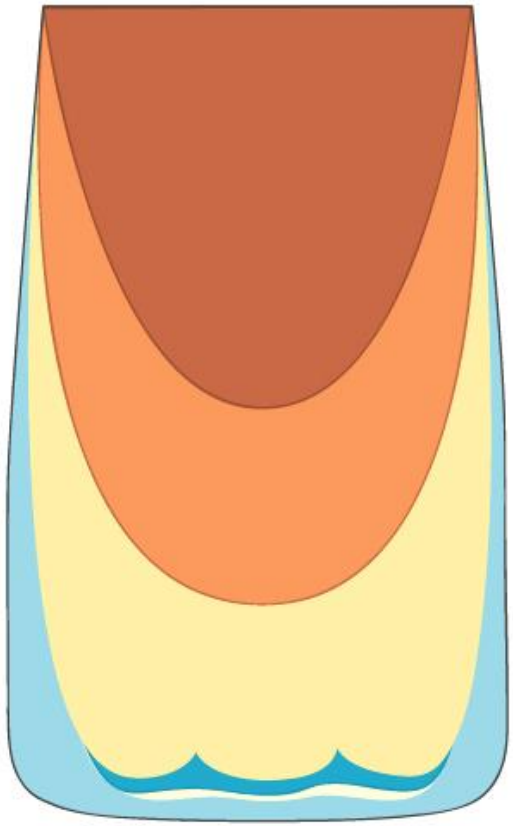
Mamelons
Opalescency
Halo effect

Optical size





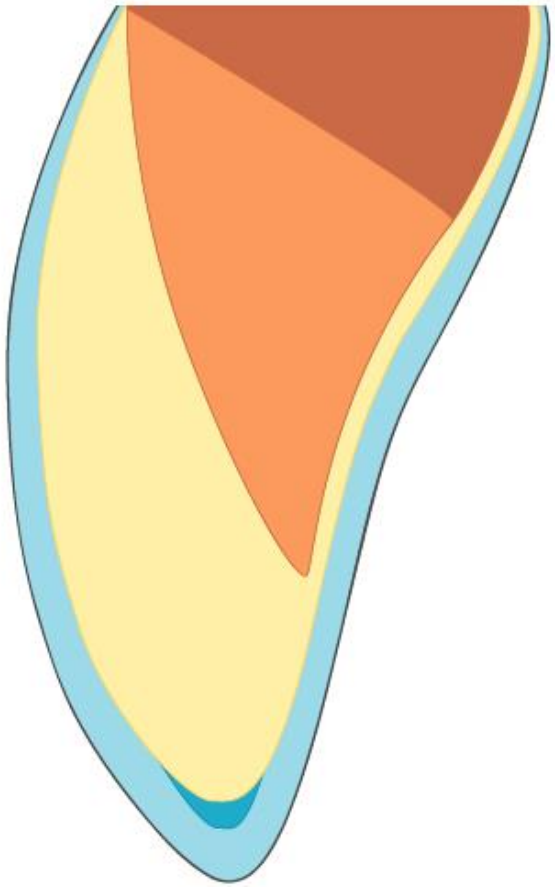
Surface texture

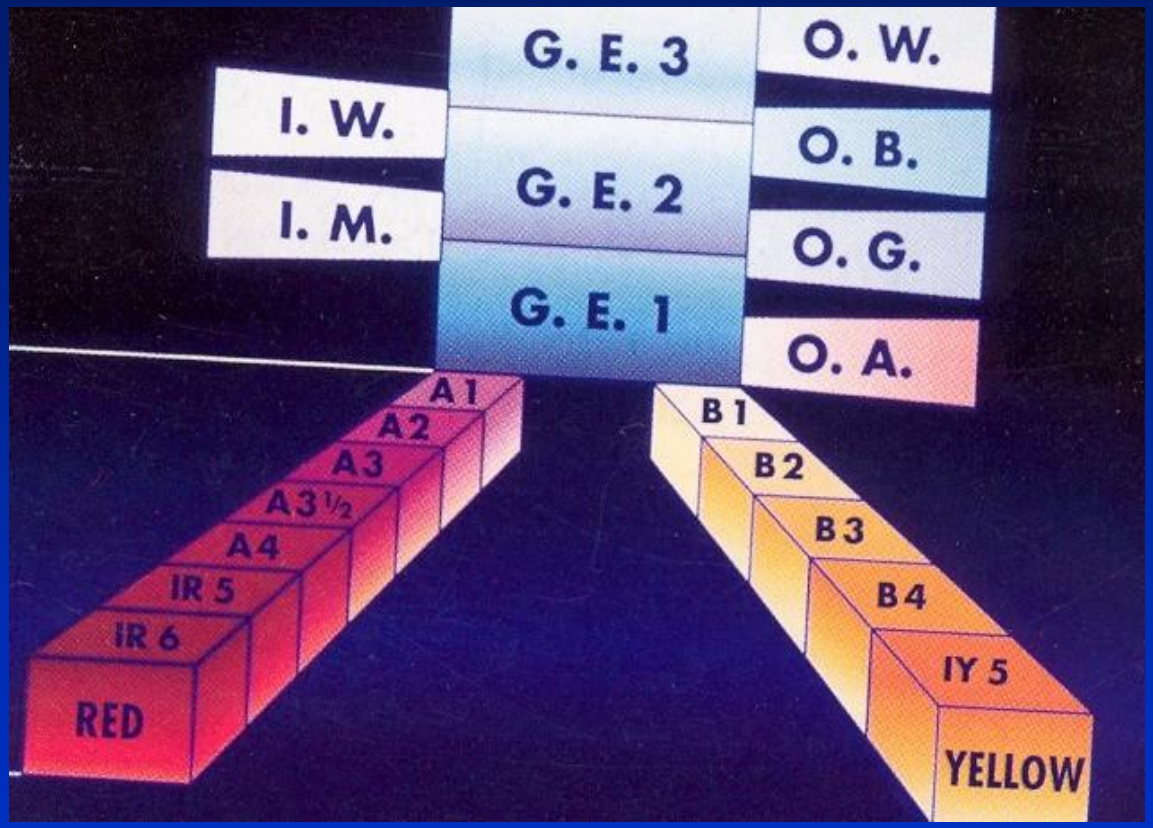


Dentin shades
Desaturation
Enamel on the surface
Opalescence
White spots
Characterization
inside enamel

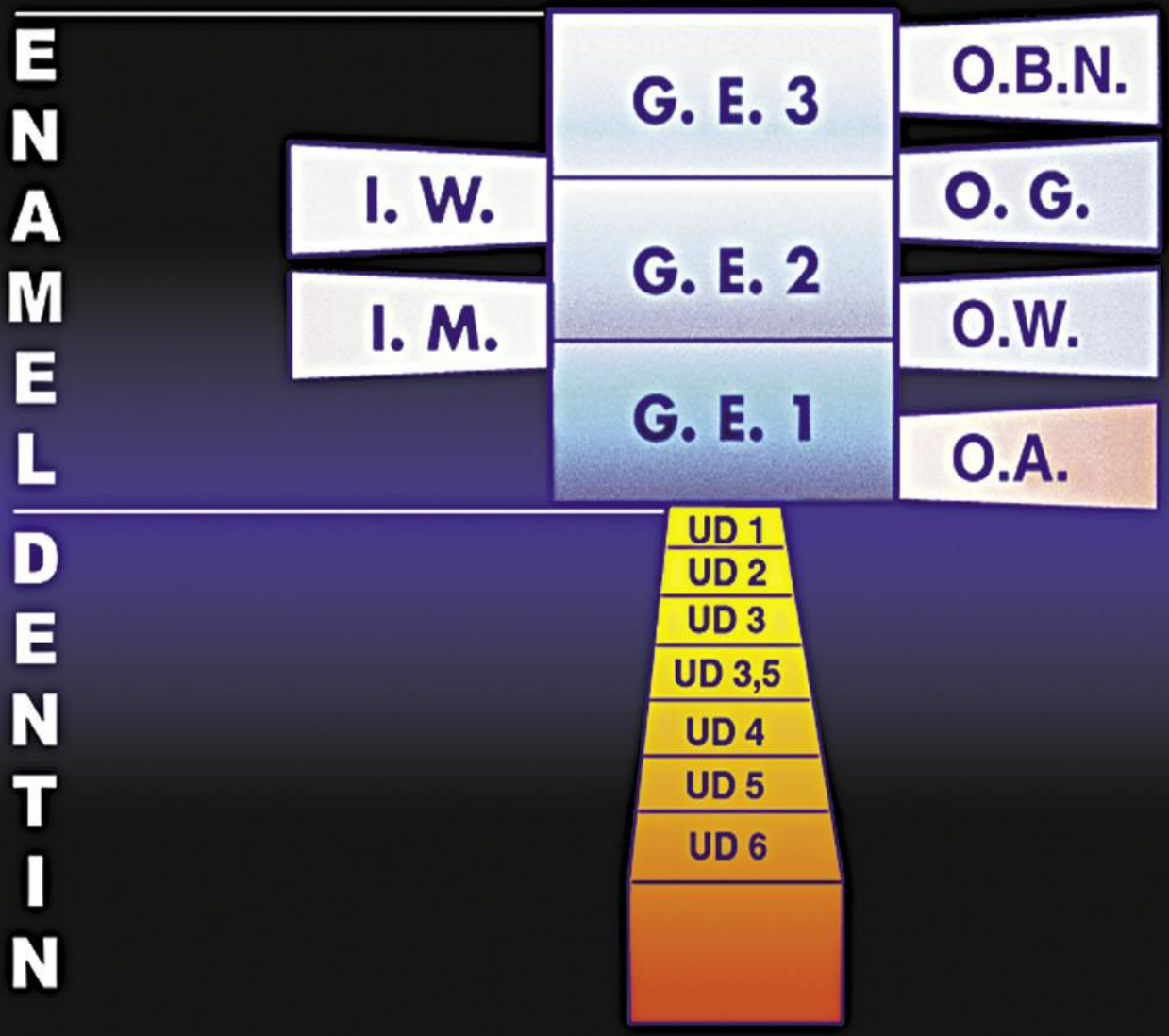
Vanini

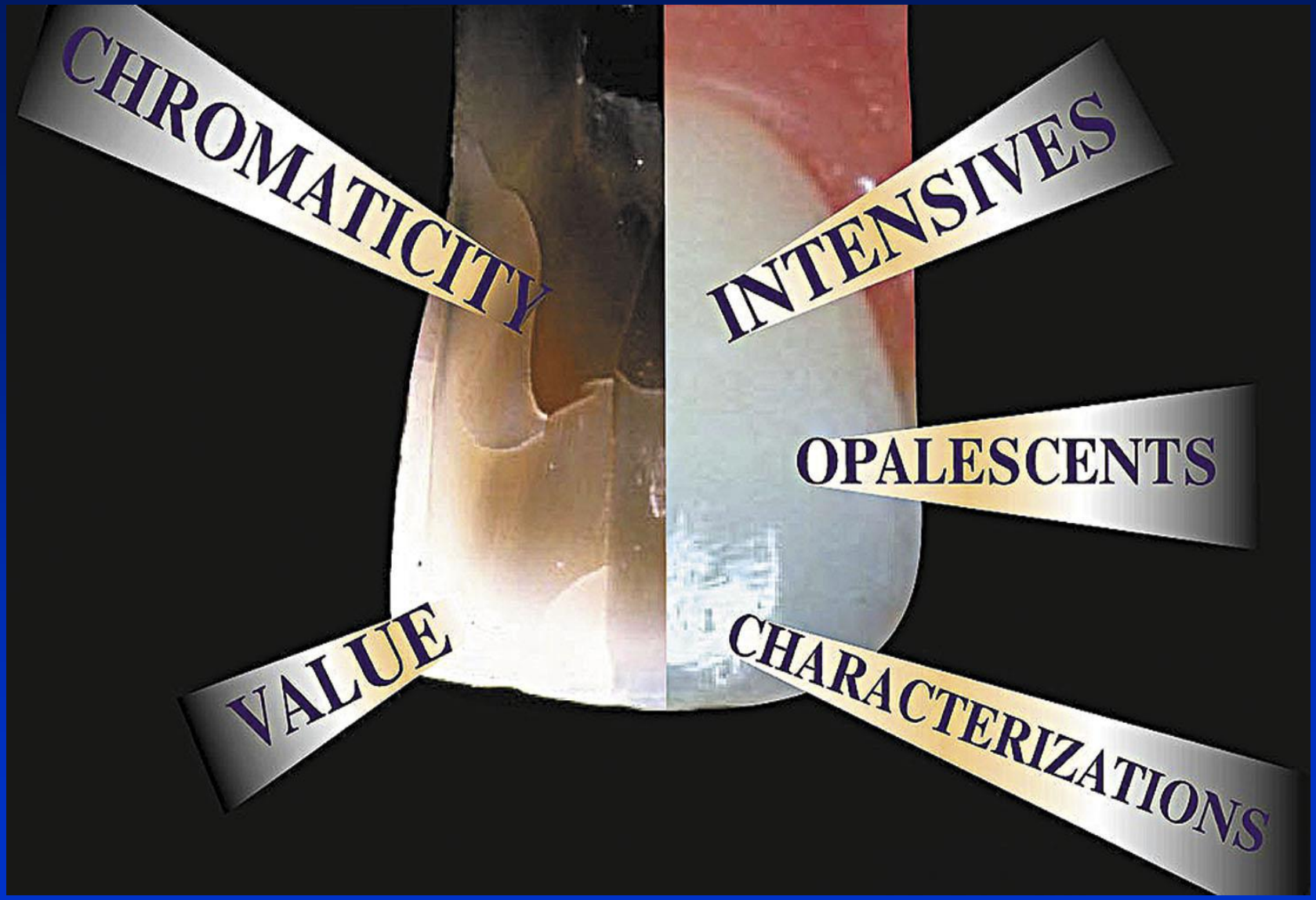
Imitation of tooth structure





Univerzální dentin

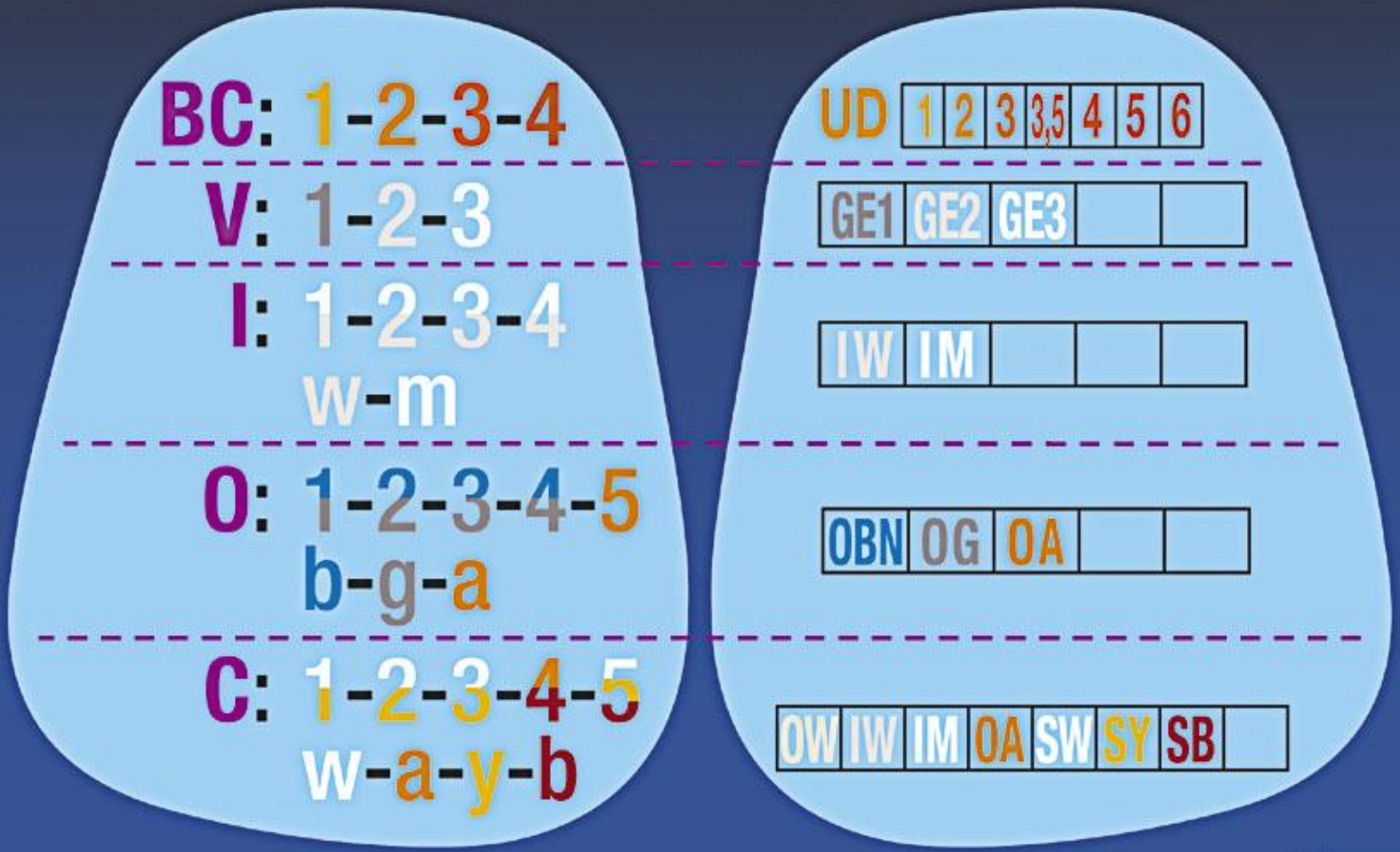

ENAMEL
DENTIN
G. E. 3
G. E. 2
G. E. 1
I. W.
I. M.
O.B.N.
O. G.
O.W.
O.A.
UD 1
UD 2
UD 3
UD 3,5
UD 4
UD 5
UD 6


CHROMATICITY
INTENSIVES
OPALESCENTS
VALUE
CHARACTERIZATIONS

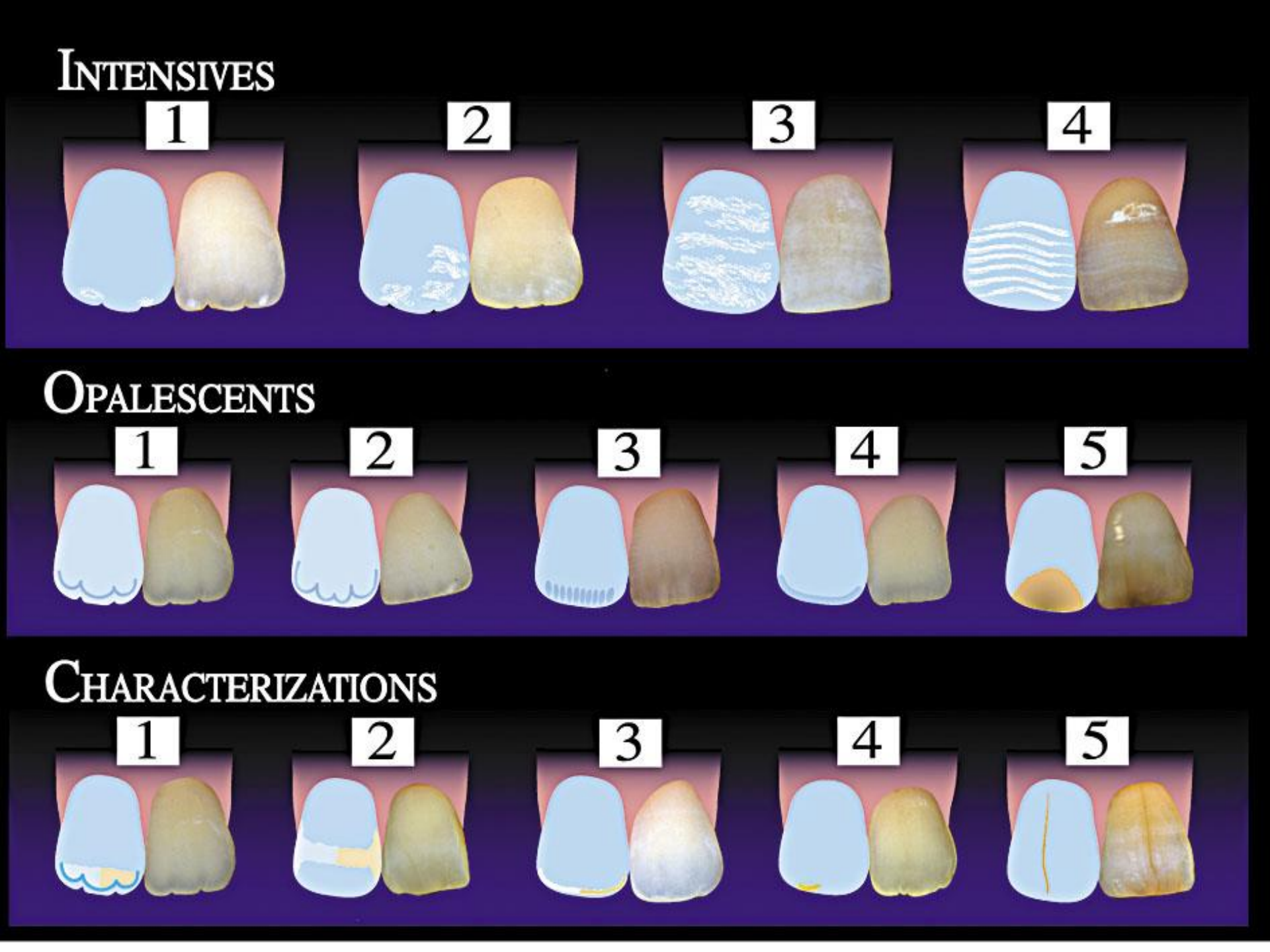
COLOUR CHART (PATENTED)

NAME .....

AGE TOOTH DATE .....



L. Vanini

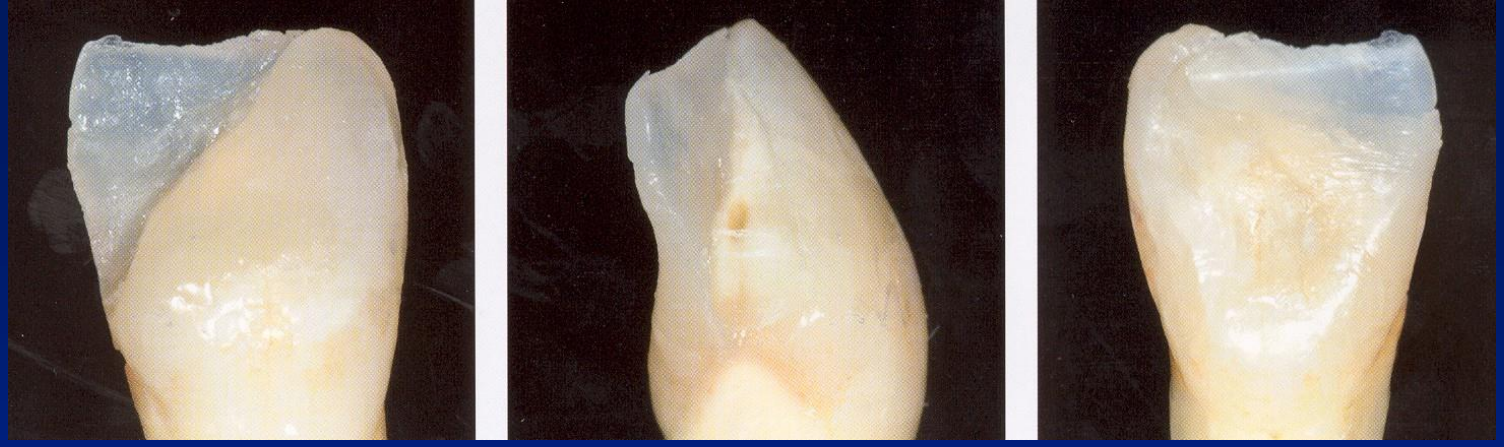

INTENSIVES
1
2
3
4
OPALESCENTS
1
2
3
4
5
CHARACTERIZATIONS
1
2
3
4
5

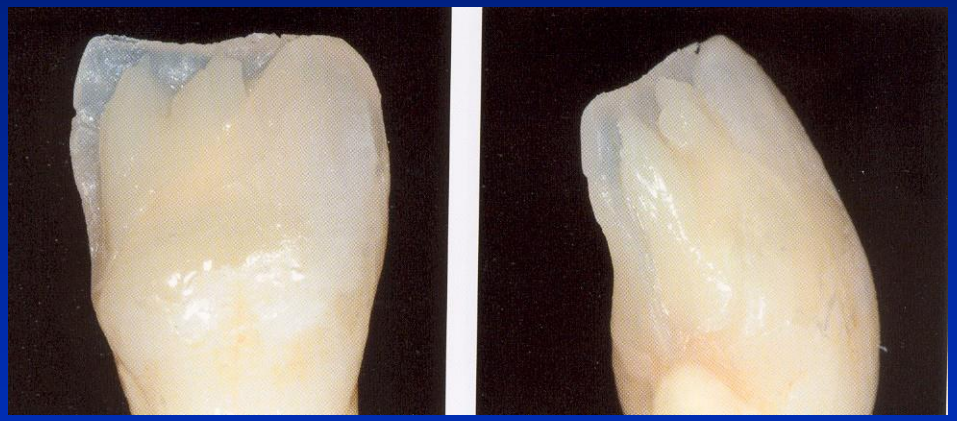


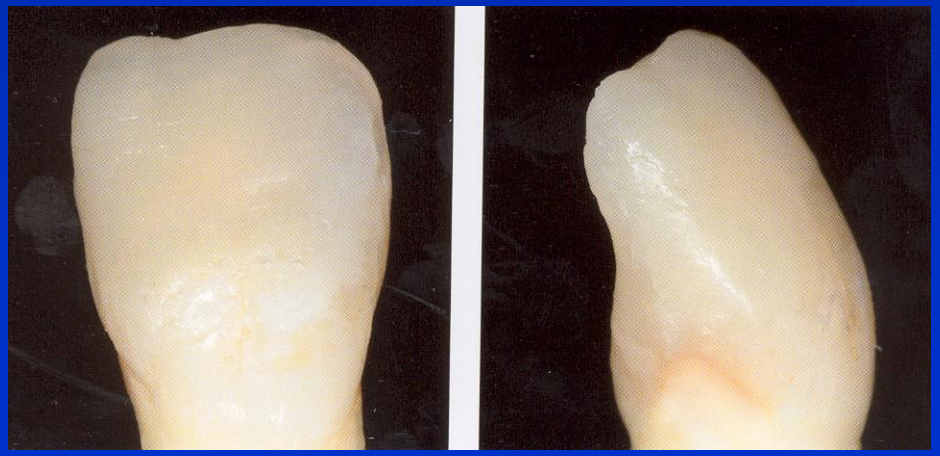


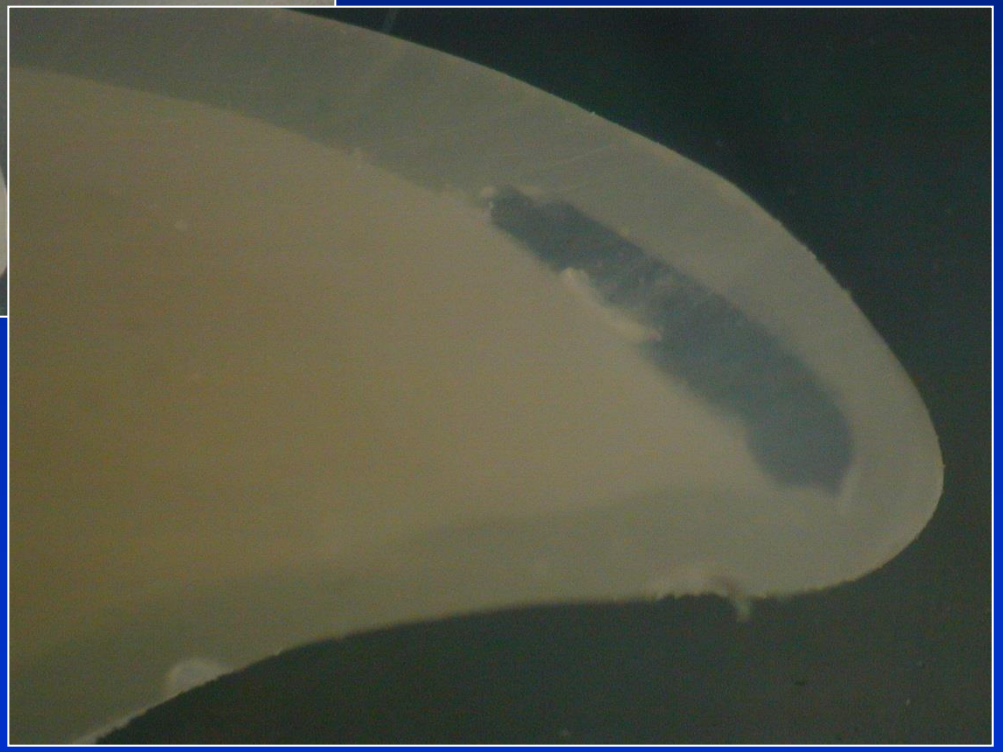




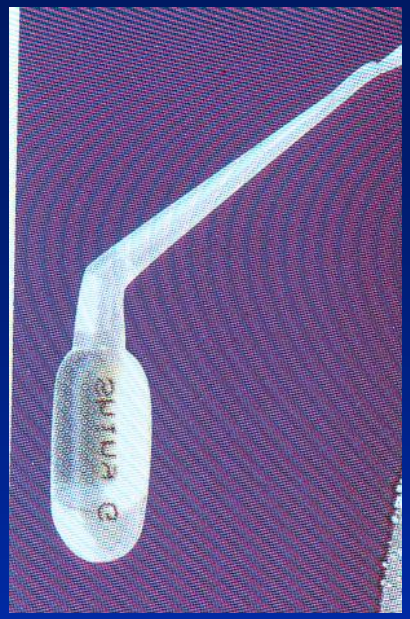




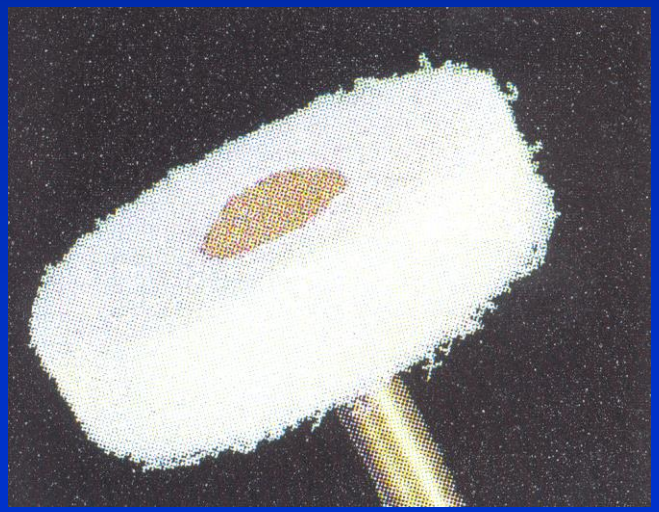




Surface texture


SHINY C


SHINY A
3 micron 2 g
ENAMEL plus
SHINY
SHINY B
1 micron 2 g
ENAMEL plus
SHINY




PASTA SHINY C 35 g
ENAMEL plus
SHINY