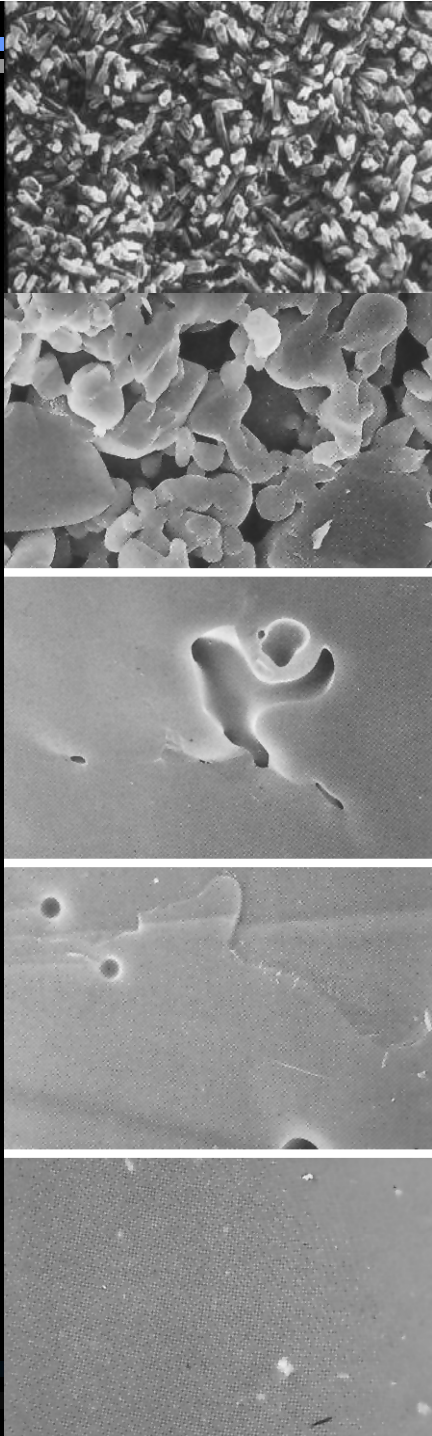




Ceramics

Asbjørn Jokstad

History

2001	CAD-CAM	Zirkonium-Ceramic
1998	Nobel biocare, Sweden	CAD-CAM Al-Ceramic (AllCeram)
1996	Micrystalsa, Switzerland	copy grinding (Celay)
1994	Dentsply, UK	pressure cast ceramic (Empress)
1990	Galvano crowns (AGC)	
1988	Sadoun, Frankreich	Slip-infiltrated Ceramic (In-Ceram)
1987	Malament, USA	Castable glas Ceramic (Dicor)
1984	Mörmann, Switzerland	CAD-CAM-consept (Cerec)
1980	Lutz, Switzerland	Indirect inlay
1965	McLean, UK	Al-rich porcelain
1923	Wain, USA	Sintered porcelain in model
1907	Taggard, USA	Wax investment
1889	Land, USA	Sintered porcelain in foil
1882	Herbst, Tyskland	Sintered glas in model

All Ceramics – in use 10 Scandinavian schools (1997)

	inlay	crowns	veneer	onlays
Empress	8	7	4	7
Vita-Cerec	7	1	2	4
Inceram	4	5	1	2
Dicor	3	4	3	2
Vita-porcelain	2	4	3	2
Mirage	2	2	3	1
Ceramco	2		2	
Cerinate			2	
Optec HSP	1	1		1
Procera		1		

Ceramics in dentistry

Production methods

1. Hand condensing and "firing" (sintering)
2. Press-forWith and sintering
3. Casting and sintering
4. Presintered-machined-glas infiltrated
5. Sintered and machined
 - Machining: copy-grind /CADCAM / Electro
6. High pressure sintering on enlarged model

Principles for fabrication- 1

Sintering

Biodent

Cerinate

Ducera Pluss

Hi-Ceram

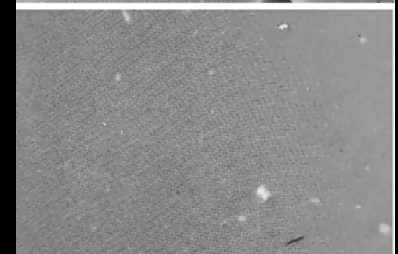
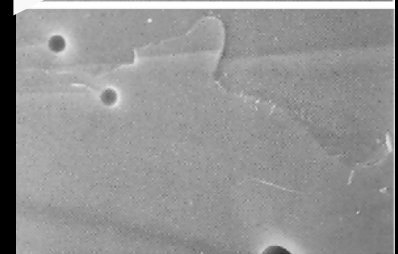
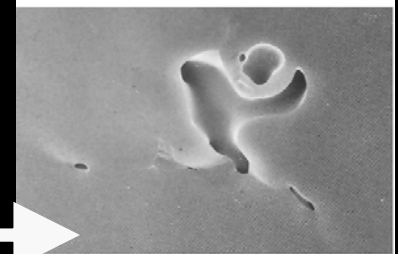
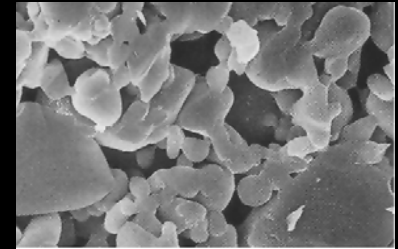
IPS Corum

Microbond

Mirage II

Optec HSP

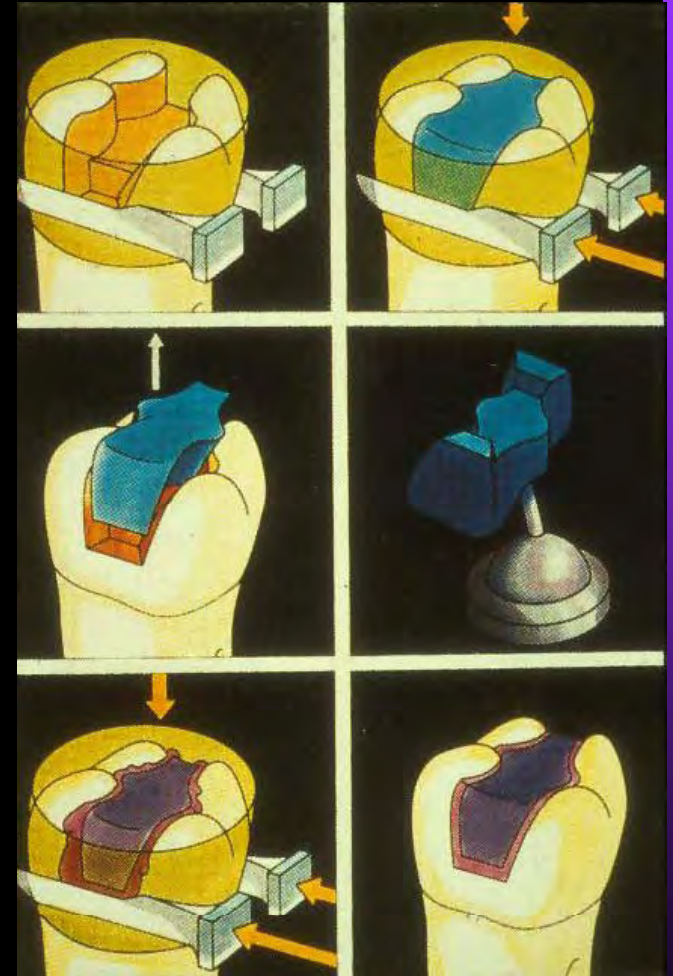
Vitadur-N



Principles for fabrication- 2

Pressforming & sintering

IPS Empress

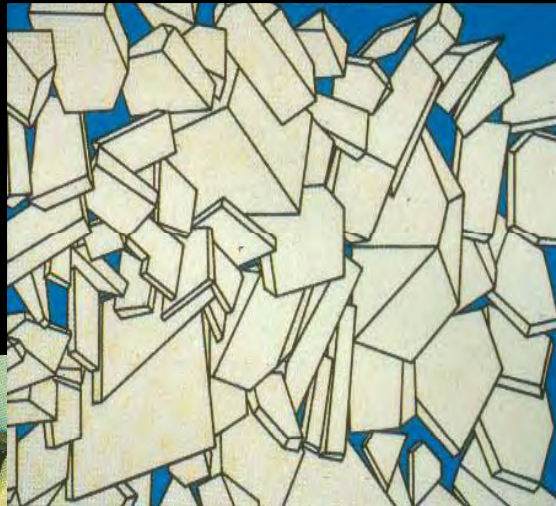


Principles for fabrication- 3

Casting & sintering

CeraPearl

Dicor



Principles for fabrication- 4

Slip-sintering In-Ceram



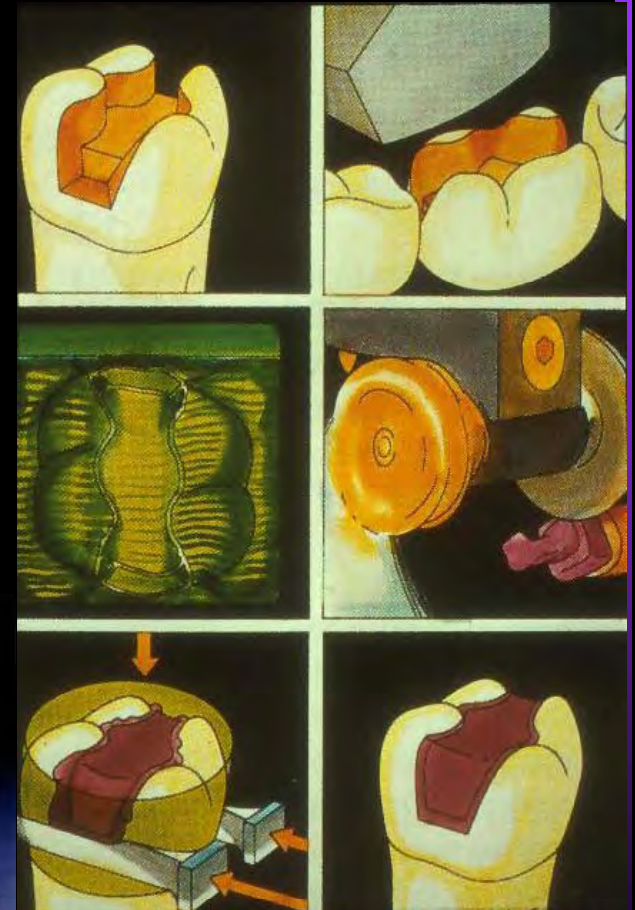
Principles for fabrication- 5

Pre- Sintered and machined

Vita-Cerec MkI

Vita-Cerec MkII

Dicor MGC



Principles for fabrication- 6

High pressure sintering
on enlarged model

Procera



Ceramics in dentistry

- Traditional feldspathic ceramics
 - With or without aluminium oxide crystals
- Feldspathic glass
 - With leucite crystals
- Tetra-silico-mica glass
- lithium-disilicate glass
- Pre-Sintered aluminium-oxide
glass infiltrated
- High pressure sintered aluminium oxide
- Zirconium oxide

Reinforcement, concepts

Magnesium-Aluminium	Alceram-Cerestore	1983
Mica	Dicor	1984
Oxyapatite	CeraPearl	1985
Leucite	Biodent	
	Optec HSP	1987
	IPS Empress	1990
Galvano techniques		1989
Aluminium-oxide	In-Ceram	1990
	Procera Allceram	1994

Ceramics

All-Purpose

- 1a. Ceramco 3**
Dentsply/Ceramco
- 1b Omega 900**
Vident
- 2. Ceramco II**
Dentsply/Ceramco
- 3a. Creation**
Jensen
- 3b. IPS d.Sign**
Ivoclar Vivadent

Bonded

- 1. IPS Empress**
Ivoclar Vivadent
- 2. IPS Eris**
Ivoclar Vivadent
- 3. OPC**
Pentron
- 4. Finesse All-Ceramic**
Dentsply/Ceramco

Miscellaneous

- 1a. Duceram LFC**
Dentsply/Ceramco
- 1b. Procera AllCeram**
Nobel Biocare
- 2. Finesse**
Dentsply/Ceramco
- 3a. In-Ceram Alumina**
Vident
- 3b. In-Ceram Spinell**
Vident

VITA

Lumin-Vacuum	A 1	A 2	A 3	A 3,5	A 4	B 1	B 2	B 3	B 4	C 1	C 2	C 3	C 4	D 2	D 3	D 4
Grund Opaque Opaco	510	511	512	513	514	515	516	514	514	517	518	518	519	520	510	521
Dentin Dentine Dentina	540	541	542	544	543	553	544	545	546	547	548	549	550	551	552	545
Schmelz Enamel Email Esmalte	558	558	559	559	560	557	559	559	559	560	559	559	560	560	559	559
Effekt Effect Eftet Efectos		561	562	562	562		561	561	562		561	562	562	561	562	561
Hals Neck Collet Cuello														563	563	

Korrektur Correction Corrección	590	Zahnfleisch Gum Gencive Encías	571	572
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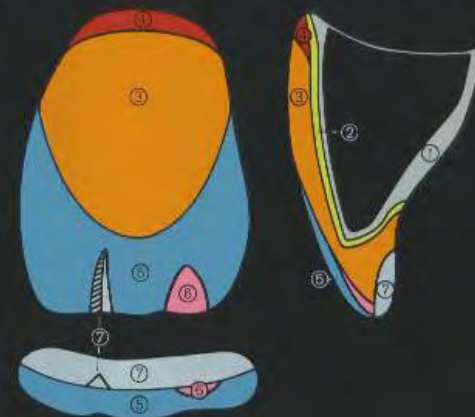
Glasklar
Transparent
Transparente

Color-Grund Color opaque Opaco Color	670	671	672	674	675	676	677	678	Color Color Color Color
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VITA

Schichtung der VMK® 68 Massen
Layering of the VMK® 68 powders
Stratification des masses VMK® 68
Laminación de los polvos de porcelana VMK® 68



● Metall	Metal	Métal	Metal
● Grund	Opaque	Opaque	Opaco
● Dentin	Dentine	Dentine	Dentina
● Hals	Neck	Collet	Cuello
● Schmelz	Enamel	Email	Esmalte
● Effekt	Effect	Eftet	Efectos
● Glasklar	Transparent	Transparente	Transparente

Vitachrom® „L“

Malfarben · Stains · Colorants · Colorantes

Sortiment
Assortment
Assortiment
Sortido

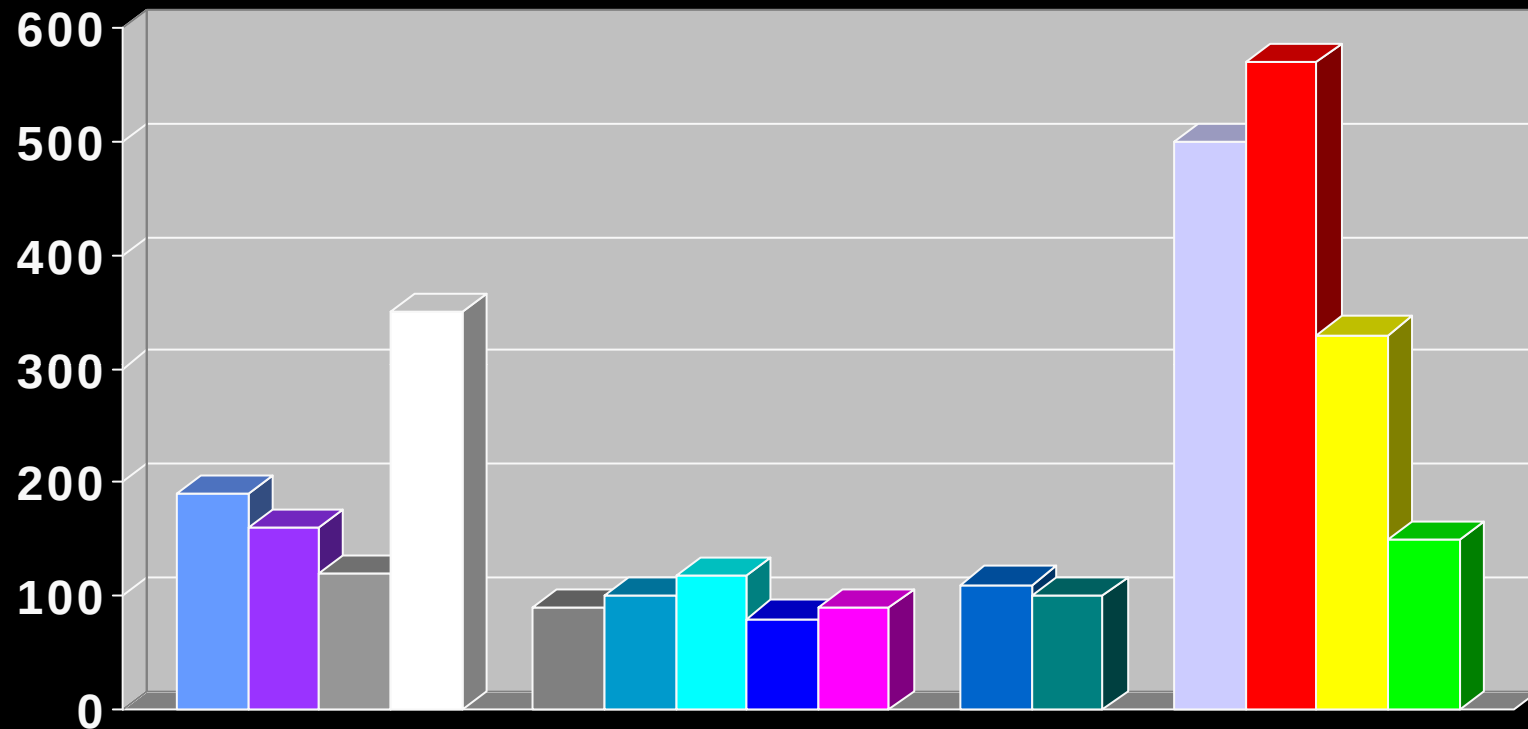
Farbenbestimmungstabelle für Zahnhals-
bemalung, Shade chart for neck staining.
Tableau du choix des teintes pour le
maquillage des collets, Tabla de selección
para colorar los cuellos.

701
702
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721

Lumin® Vacuum	Vitachrom® „L“
Farben	Farben
Shades · Teintes	Shades · Teintes
Colores	Colores
A 1	716
A 2	716
A 3	716
A 3,5	713
A 4	717
B 1	718
B 2	716
B 3	718
B 4	718
C 1	719
C 2	719
C 3	718
C 4	719
D 2	718
D 3	718
D 4	718

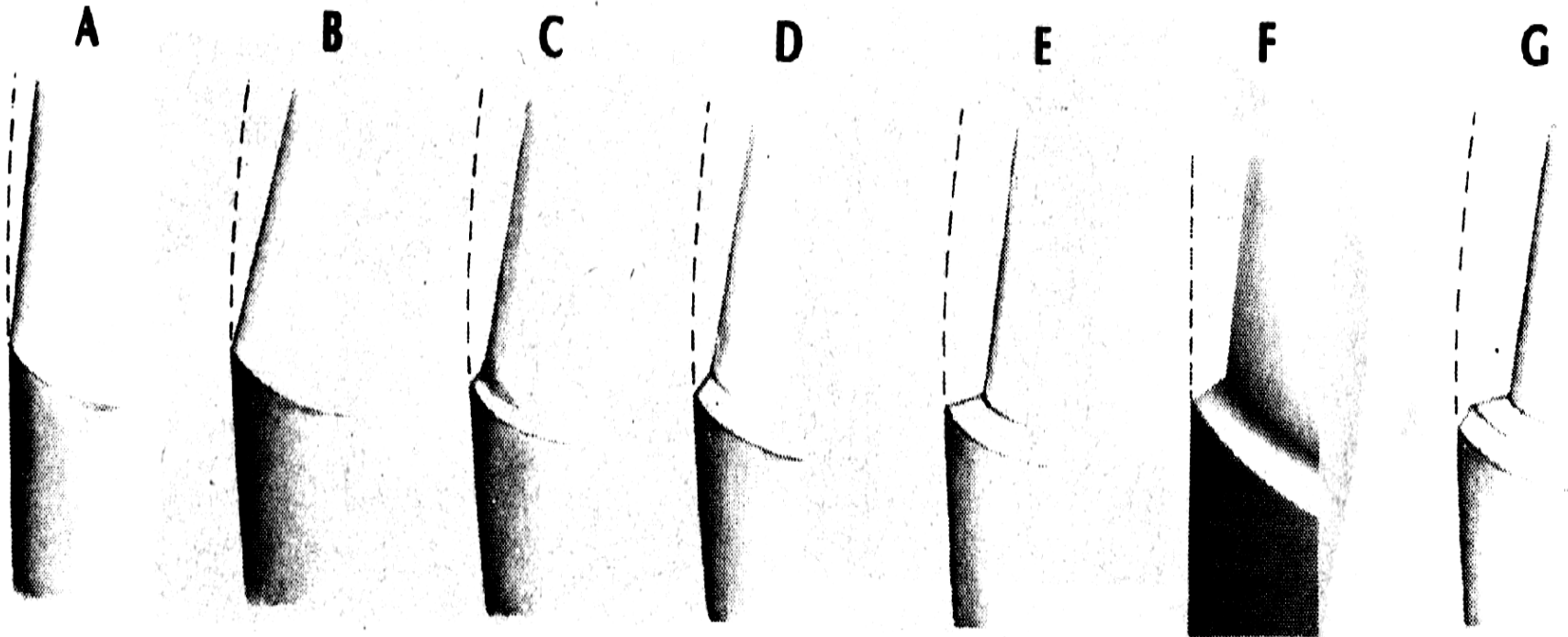
Vita Zahnfabrik · H. Rauter GmbH & Co. KG
D-7880 Bad Säckingen · West Germany

Shear strength Mpa (N/mm²)



Carrara Core	Optec OPC	Empress	Empress2
Carrara Dentin	Vitadur Alfa	Carrara Dentin	Vintage
Synspar	VMK95	Carrara Dentin	Duceram LFC
Creation LF	Carrara Dentin	InCeram Alum	InCeram Zirconia
InCeram Spinell	Cerec Mark 2		

Preparation margins



**A. Featheredge, B. Chisel, C. Chamfer, D. Bevel, E. Shoulder
F. Sloped Shoulder, G. Beveled shoulder**

Clinical aspects

- Surface treatment
- Corrosion
- Cement
- Repairs
- Polishing

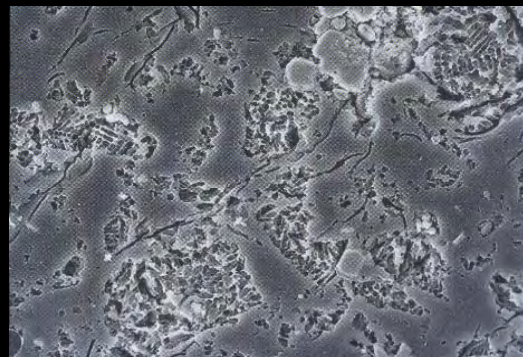
Bonding between ceramic:resin cement

1. etching with
HF acid

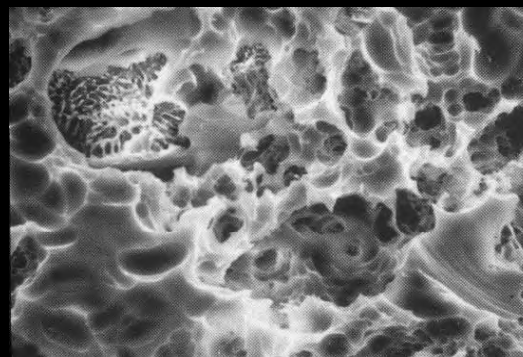
Use with care!



not etched



etched 15 sec.
HF acid (10%)

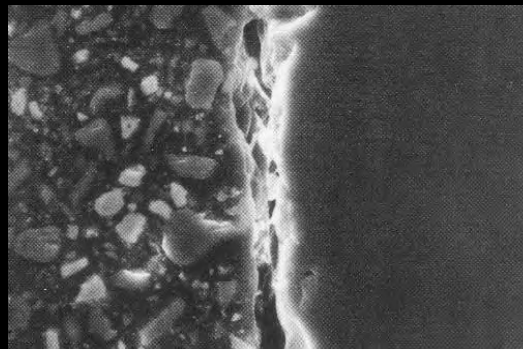
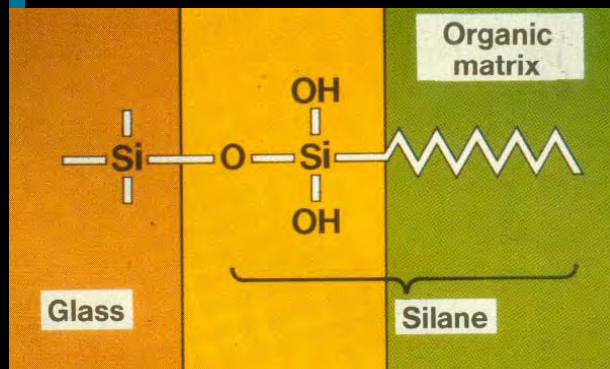


etched 60 sec.
HF acid

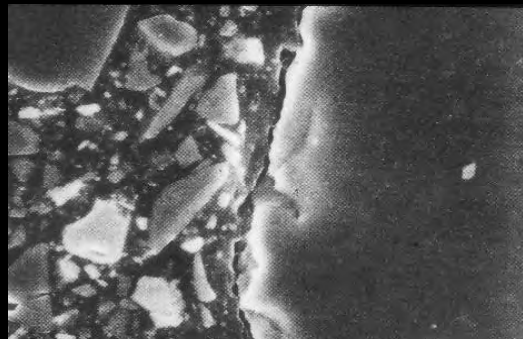
Bonding between Ceramic : resin-cement

1. etching

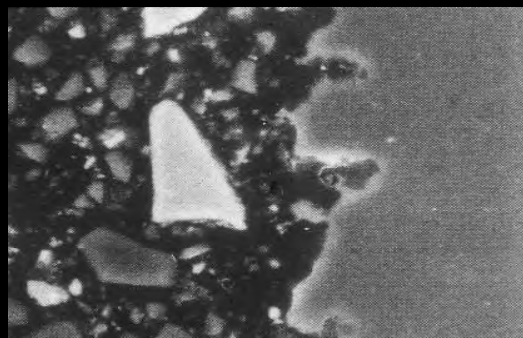
2. Silanization



not etched &
not silanized



etched &
not silanized



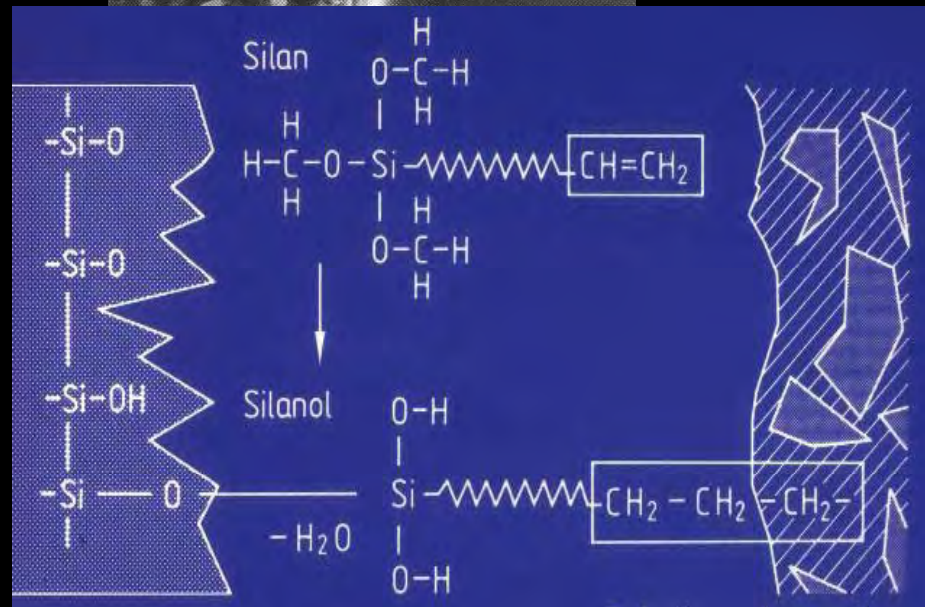
etched &
silanized

Bonding between Ceramic and resin cement

1. etching
2. Silanization immediately before cementation

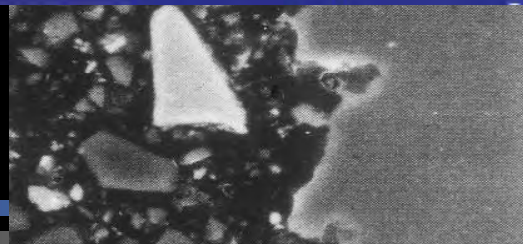


not etched -

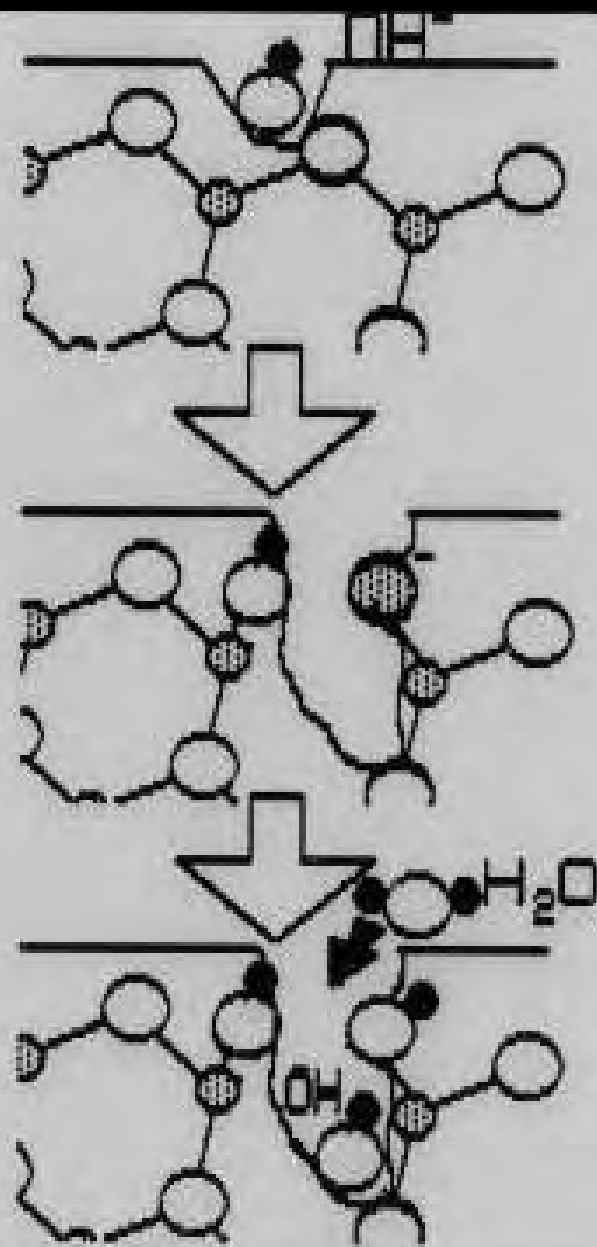
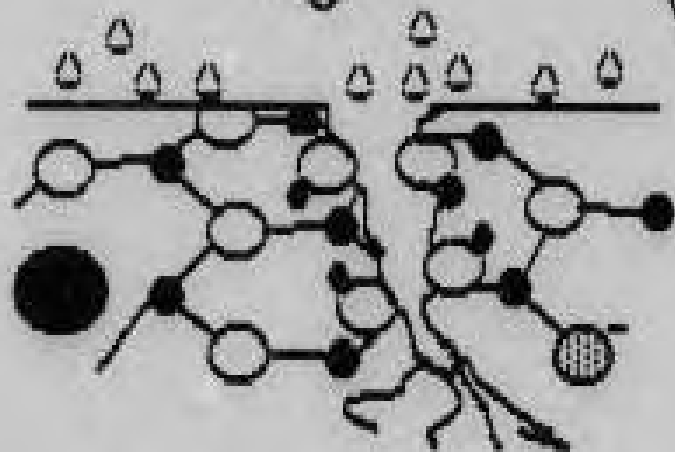
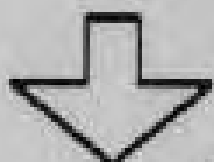
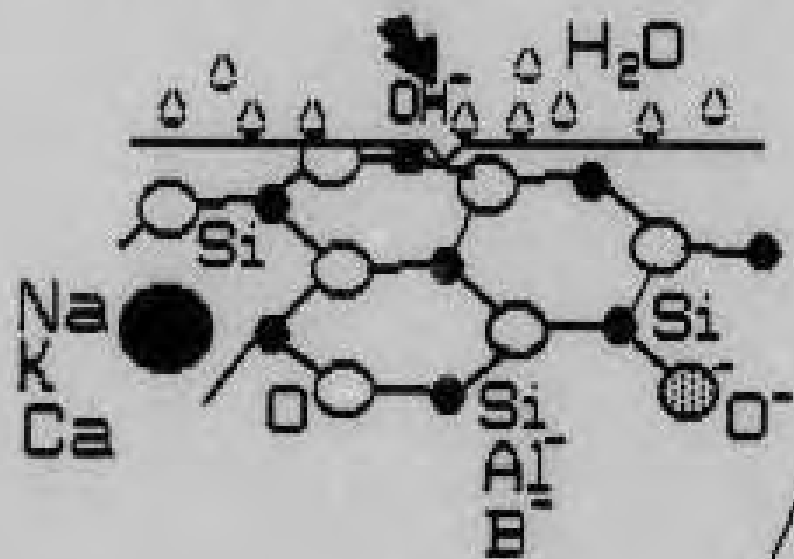


zed

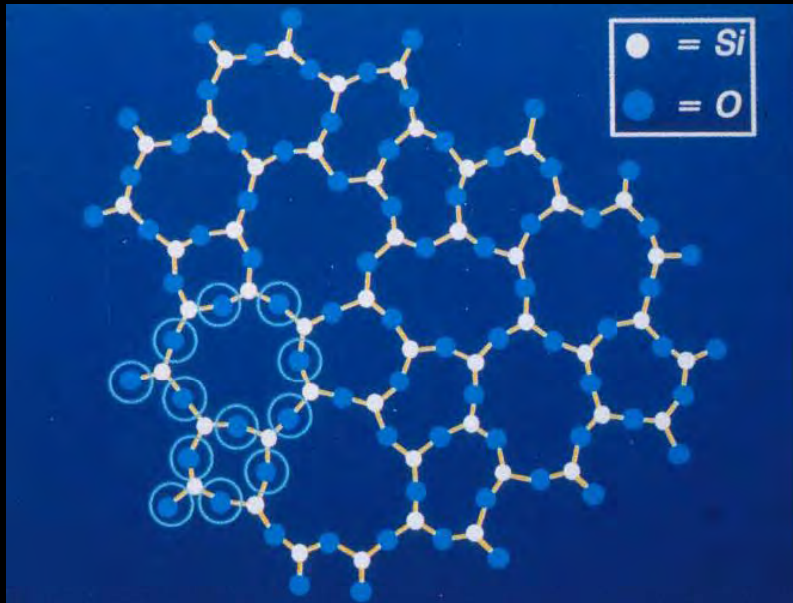
zed



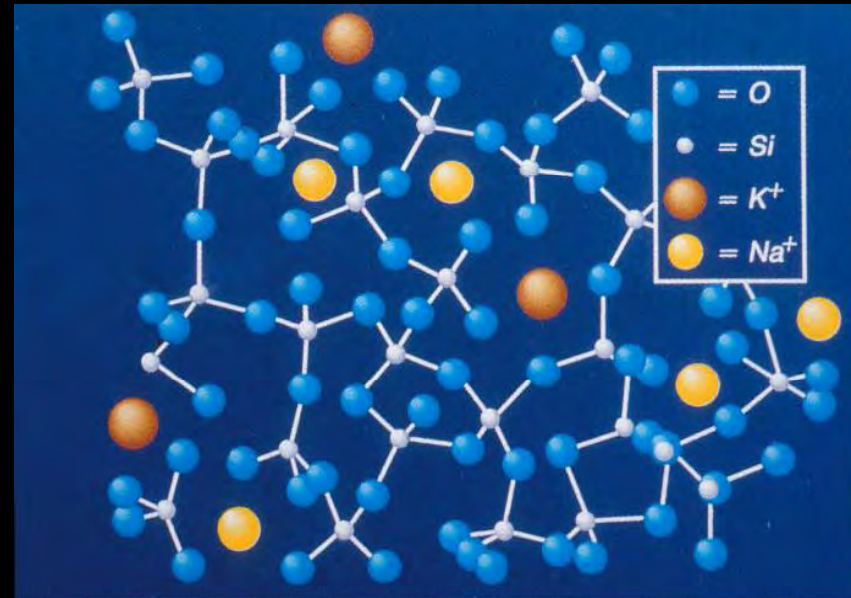
etched + Silanized



Ceramics

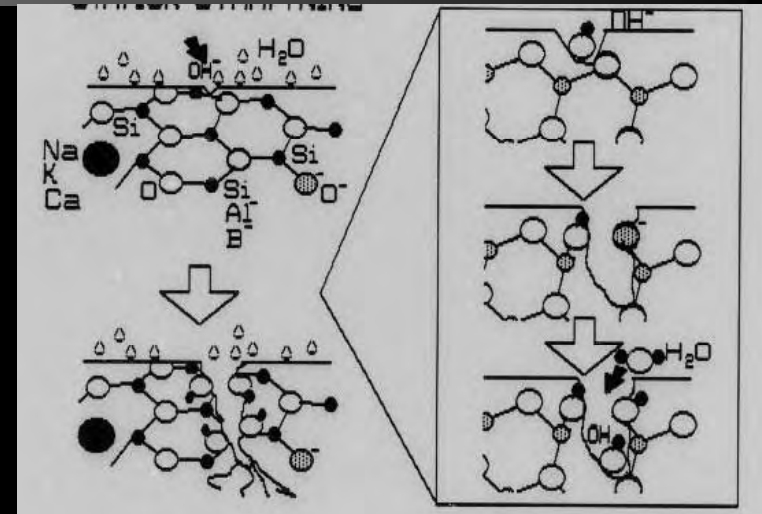
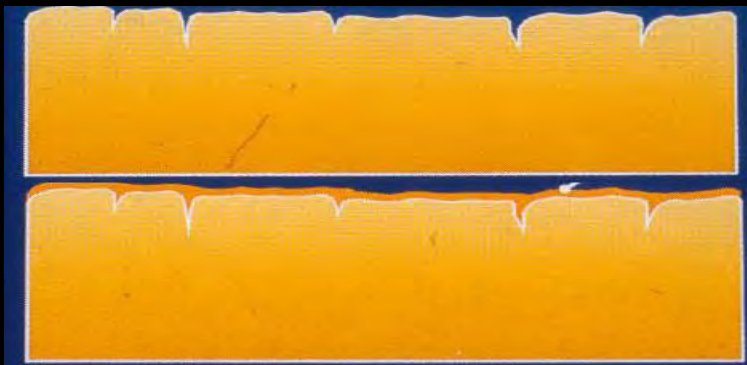
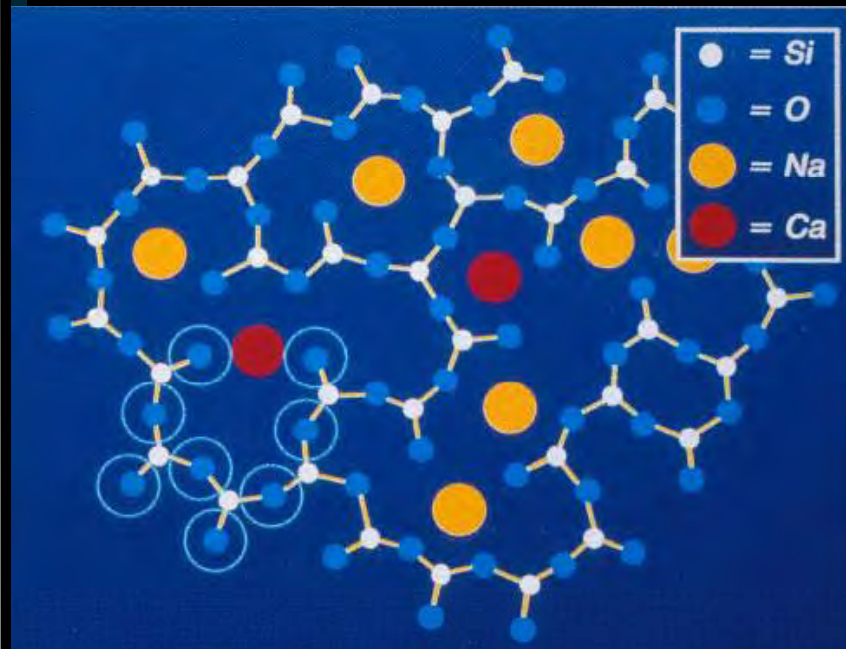


Quartz glas

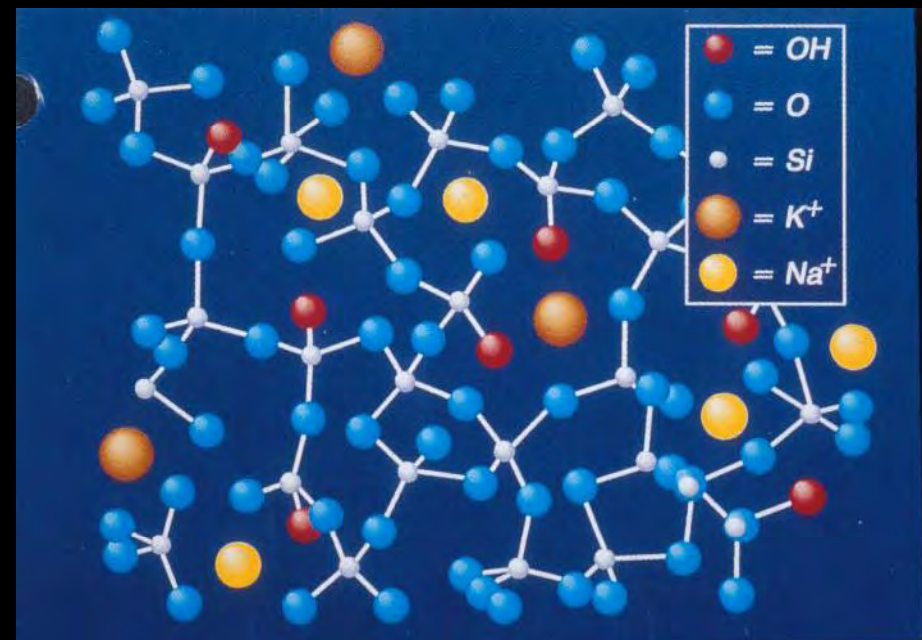


Normal glas

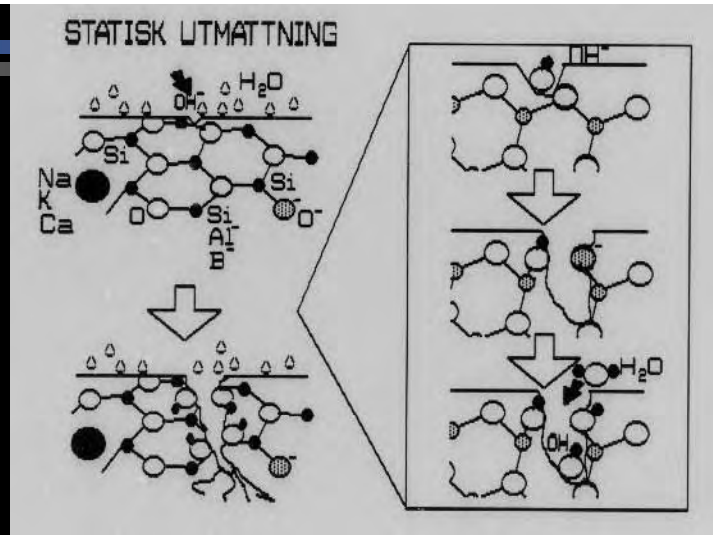
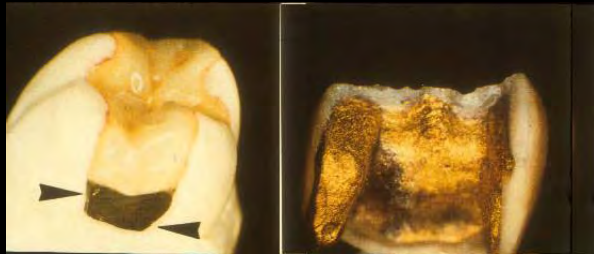
Corrosion



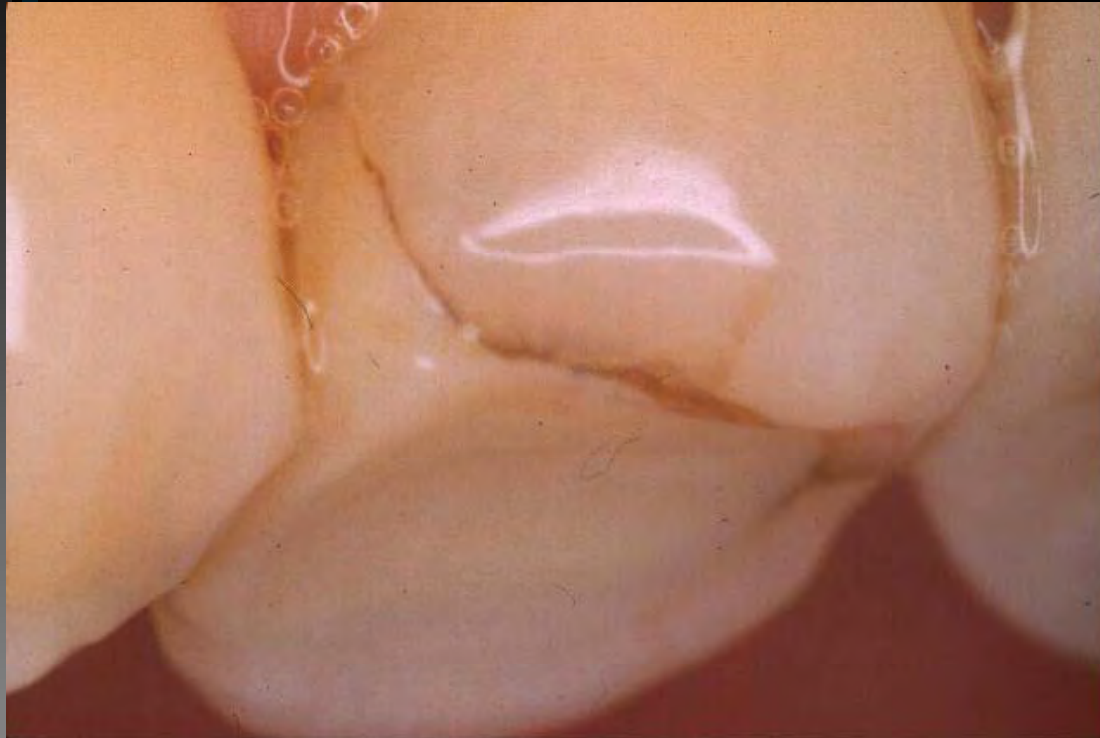
LFC=Low Fusing Ceramics



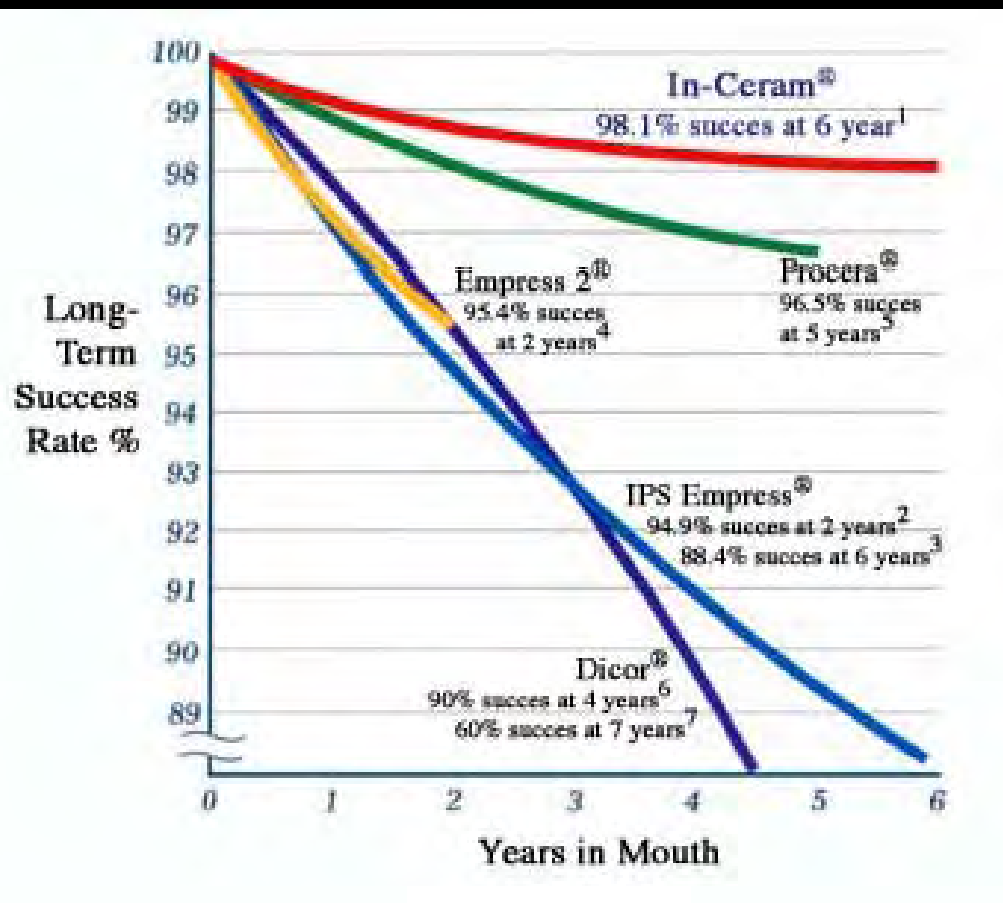
Corrosion



LFC
inner foil
alloy
cast
other
Ceramic



Clinical observations



1.A. Hüls. Georg-August University, Gottingen, Germany, 1996

2.Lehner et al. J Prosthodontics, 6:20-30, 1997

3.Lehner et al. IADR, Nice, France 1998

4.IPS Empress 2 Technical Report, 1998 Ivoclar North America

5.Odin et al. Thesis at University of Umeå, 1996

6.Ellison et al. J Dent Res, 71:207, 1992

7.Ellison et al. J Dent Res, 71:207, 1992

8.Vita Zahnfabrich, 1998

9.Seghi, Sorensen. Int J of Prosthodont, 1995