

**ZIRCONIA**  
based Dental Prostheses  
State of the art and research outcomes

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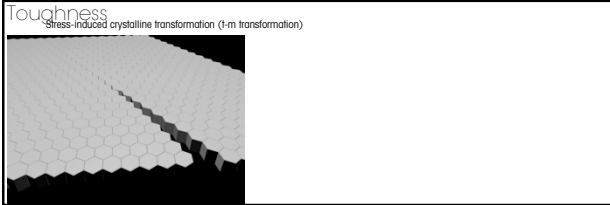
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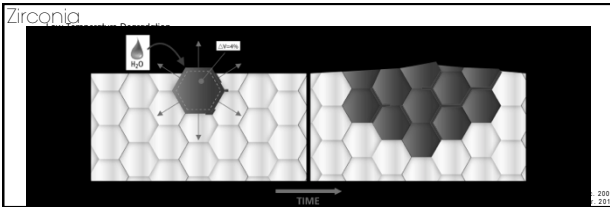
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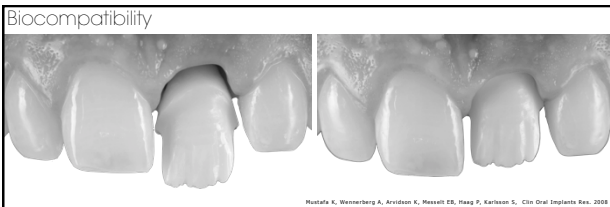
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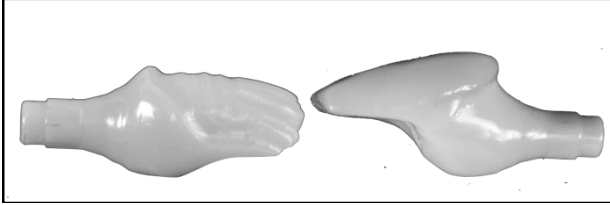
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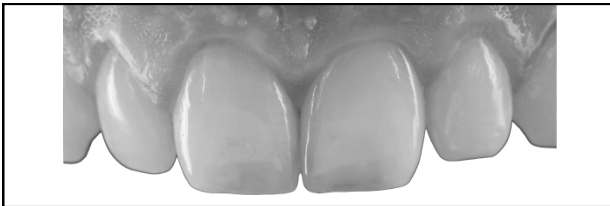
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Zirconia	
5-yr follow-up	
Survival rate <sup>1</sup>	<b>94,3%</b>
Technical complications <sup>1</sup>	<b>23,6%</b>
Framework fracture <sup>1</sup>	<b>0-10%</b>
Veneer fracture (Chipping) <sup>1</sup>	<b>0-54%</b>
	<b>12,9% Mean 32 months</b>
<b>PFM's veneer fracture significantly lower <sup>3</sup></b>	<b>2,9%<sup>2</sup></b>

<sup>1</sup> Scheel et al. Eur J Oral Maxillofac Surg. 2010; 68:1065-1074. \*Kjellberg et al. J Prosthet Dent. 2009; 101:108-112. \*Kjellberg et al. J Prosthet Dent. 2009; 101:108-112. \*Kjellberg et al. J Prosthet Dent. 2009; 101:108-112. \*Kjellberg et al. J Prosthet Dent. 2009; 101:108-112. \*Kjellberg et al. J Prosthet Dent. 2009; 101:108-112.

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# UNDERSTANDING CHIPPING



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**TENSILE STRESS= RESIDUAL STRESS+ EXTERNAL STRESS**

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Residual Stress  
Locked-in stresses generated during the cooling process

- Compressive ●
- Tensile ○



VITA VACUMAT 4000 PREMIUM

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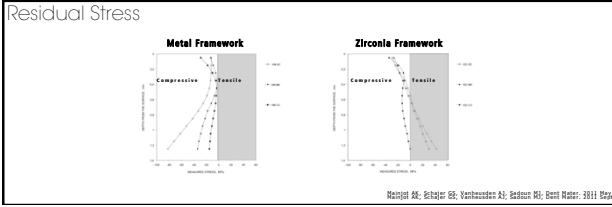
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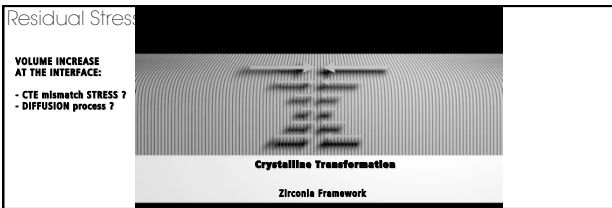
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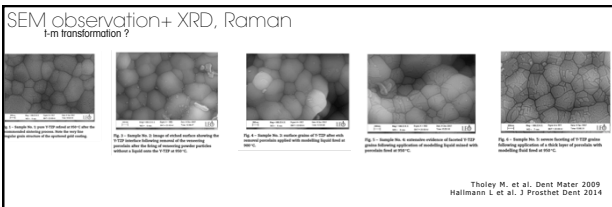
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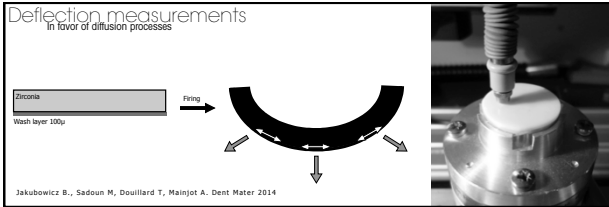
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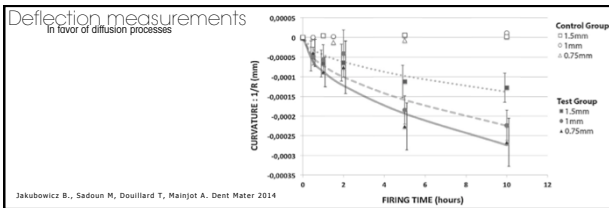
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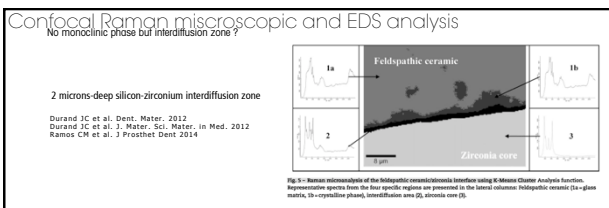
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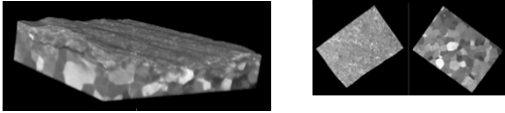
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SEM and FIB nanotomography  
Observation of structural changes



Mainjot A, Bouillard T, Grémillard L, Sadoun M, Chevalier J., Dental Materials, 2013

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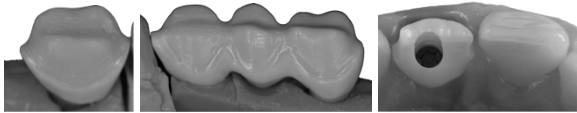
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Residual Stress  
Importance of Veneer-Framework thickness ratio

- Designed and Thick framework (min 1mm)
- Thin veneer (max 1,5 mm)



Mainjot A, Schaper EE, Vachon-Buisson A, Sadoun M, Dent Mater 2013 29(5)

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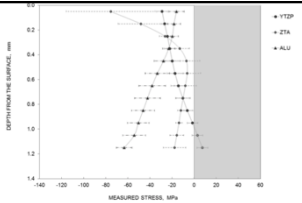
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Residual Stress  
Influence of framework material

- Alumina
- YTZP
- ZTA

0.7-1.5  
Classic cooling  
Sintered without liner



Fukushima K, Sadoun M, Cesar P, Mainjot A. Dent Mater 2014

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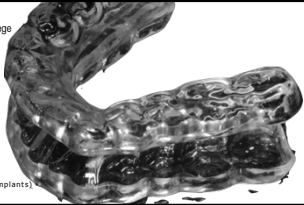
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External Stress  
Clinical risk factors: Retrospective study of the University of Liege

- **Parafunctional habits**
- **Absence of occlusal splint** <sup>1,2</sup>

- Restorations on implants
- Ceramic restoration as antagonist
- Multi-units restorations
- Hard-milling manufacturing <sup>1</sup>



<sup>1</sup>Koenig V, Vanheusden A, Mainjot A, submitted  
<sup>2</sup>Papaspyridakos et al. Clin Oral Impl Res 2012 (16 FPD's on implants)

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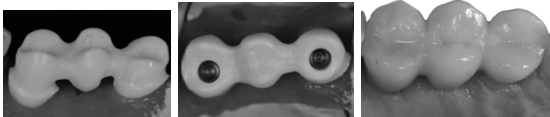
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External Stress



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External Stress



5-mths follow up

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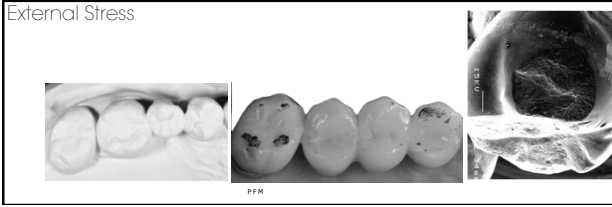
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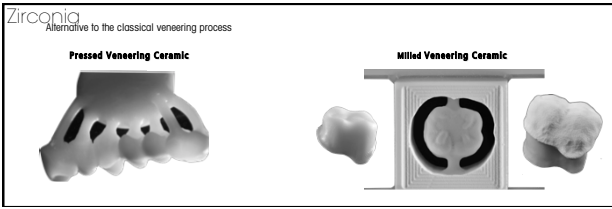
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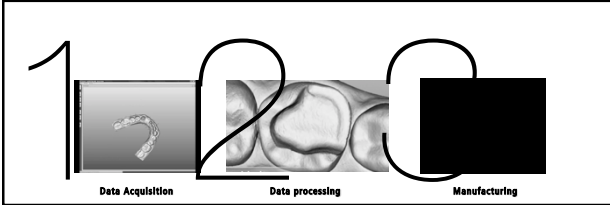
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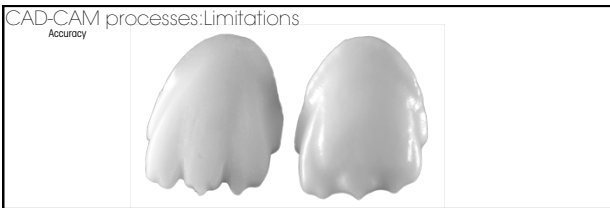
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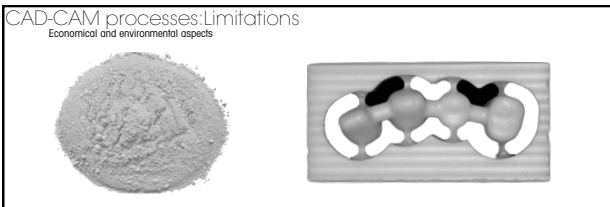
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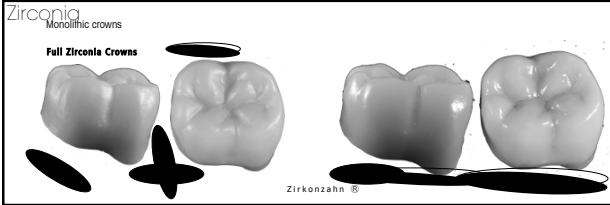
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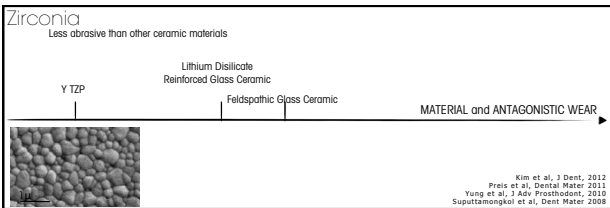
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# Merci

Institute of Dentistry, University of Liege, Belgium.  
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