

霜異한 Ceramometal System에 있어서 Nickel-Chromium합금과 陶材와의 結合強度에 關한 比較實驗研究

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ABSTRACT

A Study of Bond Strength of Nickel-Chromium Alloys with Porcelain in Ceramometal System

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In order to compare and measure bond strength of ceramometal system with use of ceramco porcelain powder including SnO₂ and uni metal, Rexillium, Vera Bond as non precious alloys manufactured for porcelain-metal restorations.

Total 24 test sample were constructed.

All Test sample were measured with a Mitutoyo micrometer graduated to 0.01mm.

It is as follows measured of thickness 3.3mm(metal : 1.1mm, porcelain: 2.2mm), width 12mm, length 30mm(porcelain 12mm x 12mm), Compared maximum bending stress test.

The results obtained were as follows:

1. Bond strength of each metal with ceramco porcelain powder showed statistical significance.(P<0.05)

2. Vera Bond and uni metal, uni metal and Rexillium revealed no statistical Significance.(P>0.05)

Vera Bond and Rexillium showed statistical significance.(P<0.05)

3. The order of maximum bending stress was Rexillium, uni metal, vera Bond.

The order of bond strength ratio making bending stress was Vera bond, uni metal, Rexillium.

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I. 서론

陶材-金屬 補綴物用 合金 貴金屬
 非貴金屬 . 黃金屬
 가
 陶材 結合力 Polishing, finishing
 (corrosion)
 陶材-金屬 補綴物用 合金 가
 가

反 陶材-金屬 補綴物用 Nickel-
 Chromium 가
 (hardness), (rigidity),
 (resistance to permanent
 deformation), (sag
 resistance), (ultimate tensile
 strength)가 metal coping

合金 陶材 結合 機
 械的 結合, 化學的 結合, 壓縮強度, Vander
 waal's force 가 가 Vickery
 6.7%, Vender
 waal's force 3% 가

陶材-金屬 補綴物用 Nickel-chromium系 非
 貴金屬 合金 Ti, Sn, Mo, Si, Al, Mn, Fe,
 Be 가 가 가 陶材 化
 學的 結合 Ti, Sn

가
 Nickel-chromium系
 市販 金屬
 合金造成 陶材
 SnO₂가 SnO₂가
 가 가
 相異 Ceramometal system
 補綴物
 가
 研究 目的
 陶材-金屬 補綴物用 Nickel-Chromium系
 Vera Bond, uni metal,

Rexillium 3種 SnO₂
 Ceramco porcelain powder(Opaque and
 Body) 相異 ceramometal
 system

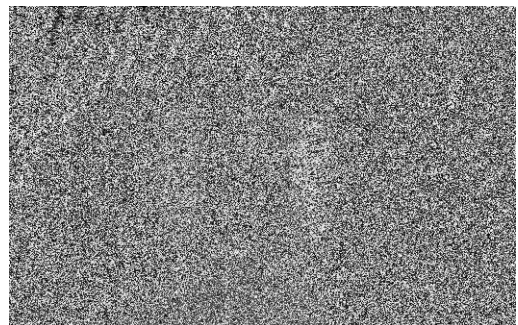
II. 實驗材料 및 方法

1. 實驗材料
 實驗材料 市販 陶材-金屬
 補綴物用 Nickel-chromium系 非貴金屬 合金
 uni metal(shofu Dental Mfg. Co., Japan),
 Rexillium (Jeneric Gold Co., U.S.A), Vera
 Bond(Chousn Dental Co., U.S.A) 3種
 Ceramoco porcelain
 powder(Creamco, Inc., U.S.A)

2. 實驗方法

1) 蠟型 製作

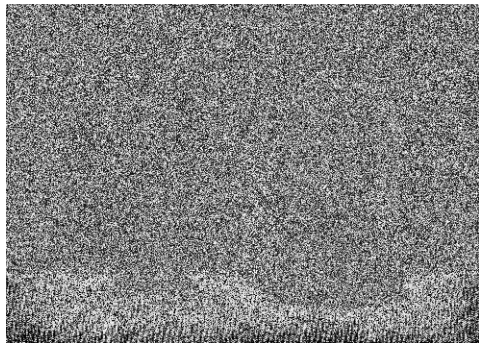
蠟型 製作 base plate wax(Han
 Deuk chemistry, Inc., Korea) 12mm,
 30mm V字
 2mm, 15mm
 가
 測定 (1)
 가 蠟型



1.

2) 鑄造體 製作

蠟型 35mm 60mm 金
 屬製 ring ring 蠟型
 가 1/4 inch가 蠟型
 (2) ring
 utility wax(Kerr Sybron Corp., U.S.A)
 sealing ringsaus asbestos
 carbon free
 phosphate bonded investment Hi-temp
 investment(Whip mix corp., U.S.A) liquid
 powder 比率 0.16(liquid 比率 4:1)
 眞空 埋沒機(DAIEI Dental
 Co. LTD., Japan) High speed
 mix(1,500~1,700rpm) 45 15
 가 埋沒 .

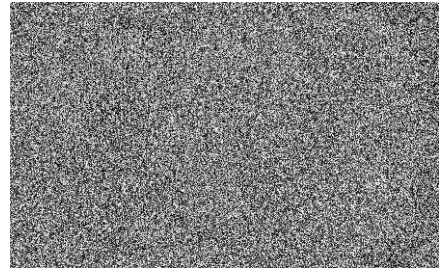


2. Ring 가 1/4 가

埋沒 ring 60 setting
 furnace
 uni metal Rexillium
 1 1800 , Vera Bond 1 30
 1600 鑄造
 金屬 鑄造體 1
 ingot uni metal
 7.2 g, Vera Bond 7.8 g, Rexillium 6 g

金屬 鎔融方向
 uni metal Rexillium -
 gas Vera Bond -
 gas
 crucible 鎔融
 鑄造 遠心鑄造機(Kerr Sybron, Corp.,
 U.S.A) 遠心力

鑄造體 5
 急冷 埋沒材 50 μ
 Shofu aluminus(shofu Dental Mfg. Co., Japan)
 sand blasting .(3)



3. Sand blasting

3) Finishing

Sand blasting 鑄造體 Vera
 Disc(AALBA Dent, Inc., U.S.A)
 spure 가 1.1mm가
 가 0.01mm micro
 meter(Mitutoyo, Mfg, Co. LTD., Japan)
 陶材用 green stone(Shofu Dental Mfg,
 Co., Japan) 가
 가

20
 pincett

4) Degassing

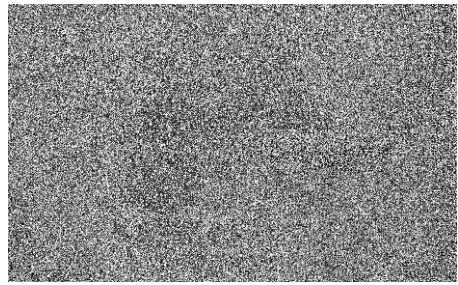
Ney mark porcelain furnace(The J. M.
 Ney Co., U.S.A)
 uni metal 1472 furnace
 1832 5 Vera
 Bond 1200 1600 가 1
 1850 3
 Rexillium 1200 1800
 degassing
 26 ~ 29 "
 degassing

5) Opaque and Body firing

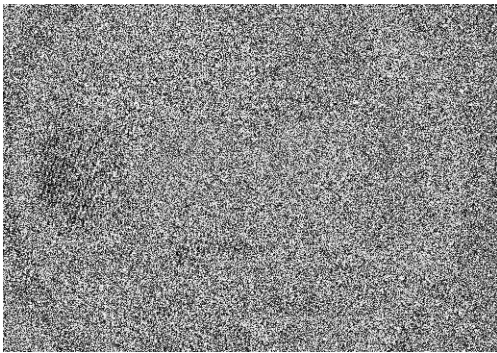
中央 12mm
 Ceramco paint-O-pake powder
 陶材築盛用 sable brush
 tissue paper
 muffle

燒成 1200 1700 眞空下 1820

cover
body powder 가 2.2mm 가
Lecron
燒成 築盛
serrated handle muffle 5
(4)

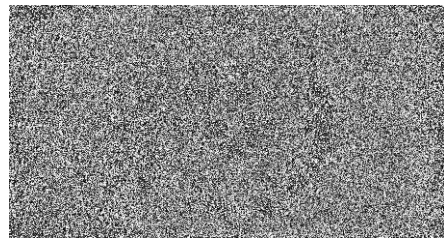


5. Micrometer



4. Muffle Preheating

(6)



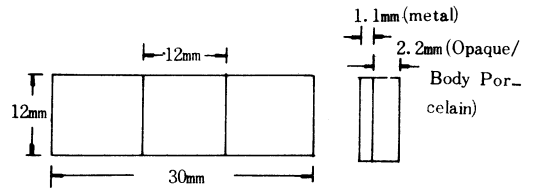
6.

燒成 1200 1700 cover

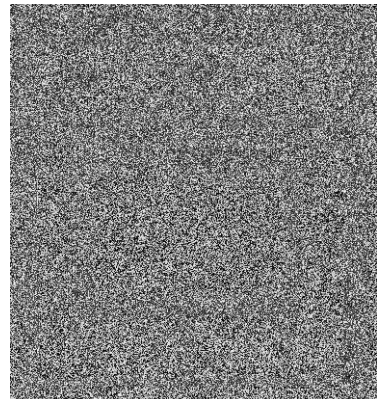
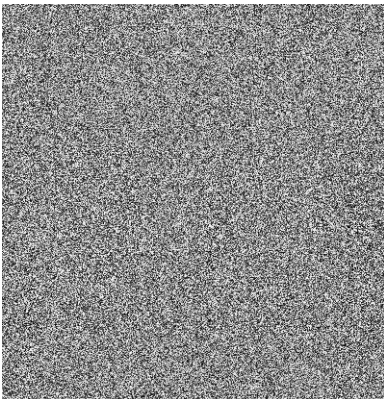
porcelain adjustment kit(Shofu Dental Mfg, Co., Japan) 가 2.2mm 가
0.1mm micro meter(Mitutoyo, Mfg, Co. LTD., Japan)
(5)

完成

7



7.



8. Universal instron machine bending stress test

6) Bending stress test

完成 試片 lower support
 2.5mm three point compression cage 陶材
 가 Universal Instron machine(Shimadzu 10
 ton, Japan) 5mm 比率 加
 加 荷重 (8)
 荷重 加 荷重 가
 加 加 .
 加壓荷重
 陶材 金屬 結合失敗
 結合失敗 金屬 荷重

stress가 가 加壓荷重

III. 實驗結果

3種 Nickel-Chromium系 陶材—金屬 補綴
 物用 非貴金屬 合金 Ceramco porcelain
 powder(Opaque and Body) 相異
 ceramometal system 陶材 金屬
 結合強度 實驗 結果 1
 合金 8 試片 bending
 stress test 結果 1

(P<0.05)

t
 Vera Bond uni metal, Uni metal
 Rexillium

Maximum Bending Stress tess (: kgf/mm²)

시편번호	Vera Bond	uni metal	Rexillium ■
1	4.6	5.7	5.8
2	4.5	5.7	5.3
3	3.8	5.9	5.6
4	5.4	4.5	5.7
5	4.9	5.5	5.2
6	5.3	5.9	5.7
7	6.6	5.2	5.2
8	5.2	5.6	6.4
합 계	T ₁ =40.3	T ₂ =44.0	T ₃ =44.9
평균	$\bar{X}_1=5.0375$	$\bar{X}_2=5.5000$	$\bar{X}_3=5.6125$
시편의 크기	n ₁ =8	n ₂ =8	n ₃ =8

분산분석표

	평방합	자유도	불편분산	F	prob
표 본 간	2.45	2	1.225	3.52	P<0.05
표 본 내	7.31	21	0.348		
합 계	9.76	23			

항 목 간	자 유 도	t 값	prob
$\bar{X}_1 - \bar{X}_2$	14	-1.5950	P>0.05
$\bar{X}_1 - \bar{X}_3$	14	-1.9495	P<0.05
$\bar{X}_2 - \bar{X}_3$	14	-0.3814	P>0.05

(P>0.05) $\sigma_{max} = (M_{max} \cdot C) / I$

Vera Bond Rexillium $M_{max} = \text{Maximum bending moment} : PL/4$
 .(P<0.05) $I : \text{moment} : bh^3/12$
 陶材-金屬 結合強度 $C : \text{neutral plane maximum stress}$
 結合強度率 $plane : h/2^{13,14,15}$
 1 以上 Maximum
 結合強度率 合金 bending stress
 結合強度率 陶材 金屬 結合強度率 .
 結合失敗가 金屬版 가 ceramometal system Ceramco porcelain
 Maximum bending stress powder maximum bending
 合金 stress Rexillium , uni metal, Vera Bond
 金屬版 b 金屬版 h maximum bending stress
 maximum 結合強度率 Vera Bond, uni
 stress metal, Rexillium

Maximum Bending Stress 結合強度率(BSR)

合金	σ_{max}, psi	BSR $\times 10^3$
Vera Bond	16497±1880	0.75
uni metal	18583±1563	0.70
Rexillium ■	19015±1349	0.68

IV. 總括 및 考案

結合強度率
比較 가
比率 가

Ceramometal system 가
 陶材-金屬 補綴物用 Nickel-chromium系
 非貴金屬 合金 Vera Bond, uni metal,
 Rexillium 3種 SnO₂ Ceramco porcelain powder
 가 .(P<0.05)
 實驗 結果 相異
 ceramcometal system 比較
 比較 結合強度
 (handness), (rigidity),
 (resistance to permanent deformation),
 (sag resistance),
 (ultimate tensile strength) 가 3,4,5 非貴金
 屬 合金
 補綴物 製作

線型的 stress-strain 線型性 合金 非
 stress-strain 結合強度 合金
 maximum stress 合金

V. 結 論

相異 ceramcometal system 結合強度
測定, 比較

陶材-金屬 補綴物用 Nickel-
chromium系 非貴金屬 合金 Vera Bond,
uni metal, Rexillium SnO₂
Ceramco porcelain powder
3.3mm(metal:1.1mm, porcelain:2.2mm),
12mm, 30mm(porcelain:12×12mm) 試
片 24 bending stress test
結合強度 測定, 比較

1. metal Ceramco porcelain powder
結合強度
(P<0.05)

2. Vera Bond uni metal나 Rexillium
가
(P>0.05) Vera Bond Rexillium
(P<0.05)

3. Maximum bending stress Rexillium ,
uni metal, Vera Bond
結合強度率 Vera Bond, uni metal, Rexillium

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