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ภาคผนวก

ตาราง ก แสดงค่าเฉลี่ยของค่าความแข็งผิวแบบวิคเคอร์ของชั้นตัวอย่างแต่ละชั้นในแต่ละวัสดุ

วัสดุ ชั้นที่	เซรามิค	เรซินคอมโพสิต	วัสดุทดลอง	เคลือบฟันมนุษย์
1	556.20	109.55	293.11	319.31
2	562.96	105.72	289.29	327.14
3	555.30	112.21	271.01	319.54
4	566.55	105.81	282.79	342.42
5	548.05	109.29	290.90	336.79
6	550.11	112.55	290.36	326.32
7	544.74	111.84	286.09	330.39
8	557.86	109.71	289.46	333.20
9	539.86	108.37	279.42	353.31
10	550.34	106.07	286.62	325.55
11	544.84	107.80	290.56	346.47
12	541.67	113.51	289.90	348
13	541.57	110.59	289.37	348.35
14	547.45	115.50	298.37	343.96
15	540.92	109.37	285.35	355.25
16	548.61	111.07	288.42	329.67
17	543.87	101.21	284.77	334.41
18	545.07	111.96	286.41	321.67
19	562.61	110.72	275.35	351.31
20	551.87	112.89	295.70	329.29

ตาราง ข การทดสอบข้อมูลค่าเฉลี่ยความแข็งผิวแบบวิกเคอร์ของวัสดุบูรณะทุกกลุ่ม และเคลือบฟันมนุษย์ ด้วยการวิเคราะห์สถิติ โดยใช้การวิเคราะห์ความแปรปรวนแบบจำแนกทางเดียว(one-way ANOVA)

**Descriptive Statistics**

material		N	Minimum	Maximum	Mean	Std. Deviation
ceramic	VHN	20	539.86	566.55	550.0225	7.90380
	Valid N (listwise)	20				
composite	VHN	20	101.21	115.50	109.7870	3.30795
	Valid N (listwise)	20				
experimental material	VHN	20	271.01	298.37	287.1625	6.42316
	Valid N (listwise)	20				
enamel	VHN	20	319.31	355.25	336.1175	11.65025
	Valid N (listwise)	20				

การทดสอบการกระจายตัวของข้อมูลค่าความแข็งผิวแบบวิกเคอร์ในวัสดุแต่ละกลุ่ม

**One-Sample Kolmogorov-Smirnov Test**

material			VHN
ceramic	N		20
	Normal Parameters <sup>a,b</sup>	Mean	550.0225
		Std. Deviation	7.90380
	Most Extreme Differences	Absolute	.135
		Positive	.135
		Negative	-.099
	Kolmogorov-Smirnov Z		.602
	Asymp. Sig. (2-tailed)		.862
composite	N		20
	Normal Parameters <sup>a,b</sup>	Mean	109.7870
		Std. Deviation	3.30795
	Most Extreme Differences	Absolute	.140
		Positive	.080
		Negative	-.140
	Kolmogorov-Smirnov Z		.627
	Asymp. Sig. (2-tailed)		.826
experimental material	N		20
	Normal Parameters <sup>a,b</sup>	Mean	287.1625
		Std. Deviation	6.42316
	Most Extreme Differences	Absolute	.155
		Positive	.130
		Negative	-.155
	Kolmogorov-Smirnov Z		.692
	Asymp. Sig. (2-tailed)		.724
enamel	N		20
	Normal Parameters <sup>a,b</sup>	Mean	336.1175
		Std. Deviation	11.65025
	Most Extreme Differences	Absolute	.139
		Positive	.139
		Negative	-.113
	Kolmogorov-Smirnov Z		.619
	Asymp. Sig. (2-tailed)		.838

a. Test distribution is Normal.

b. Calculated from data.



แสดงการทดสอบความเท่ากันของความแปรปรวนของข้อมูลค่าเฉลี่ยความแข็งแรงแบบวิคเคอร์

### Test of Homogeneity of Variances

VHN

Levene Statistic	df1	df2	Sig.
11.501	3	76	.000

แสดงการทดสอบข้อมูลค่าเฉลี่ยความแข็งแรงแบบวิคเคอร์ด้วยการวิเคราะห์การแปรปรวนแบบทางเดียว

### ANOVA

VHN

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1968711	3	656236.966	10483.105	.000
Within Groups	4757.561	76	62.599		
Total	1973468	79			

### Robust Tests of Equality of Means

VHN

	Statistic <sup>a</sup>	df1	df2	Sig.
Brown-Forsythe	10483.105	3	49.336	.000

a. Asymptotically F distributed.

แสดงการทดสอบข้อมูลค่าเฉลี่ยความแข็งผิวแบบวิคเคอร์ด้วยการเปรียบเทียบเชิงซ้อนแบบแทมเฮน  
(Tamhane's multiple comparison)

### Multiple Comparisons

Dependent Variable: VHN

Tamhane

(I) material	(J) material	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
ceramic	composite	440.23550*	1.91589	.000	434.7723	445.6987
	experimental material	262.86000*	2.27736	.000	256.5256	269.1944
	enamel	213.90500*	3.14800	.000	205.1033	222.7067
composite	ceramic	-440.23550*	1.91589	.000	-445.6987	-434.7723
	experimental material	-177.37550*	1.61554	.000	-181.9427	-172.8083
	enamel	-226.33050*	2.70805	.000	-234.1533	-218.5077
experimental material	ceramic	-262.86000*	2.27736	.000	-269.1944	-256.5256
	composite	177.37550*	1.61554	.000	172.8083	181.9427
	enamel	-48.95500*	2.97477	.000	-57.3405	-40.5695
enamel	ceramic	-213.90500*	3.14800	.000	-222.7067	-205.1033
	composite	226.33050*	2.70805	.000	218.5077	234.1533
	experimental material	48.95500*	2.97477	.000	40.5695	57.3405

\*. The mean difference is significant at the .05 level.

ตาราง ค แสดงค่าความแข็งแรงดึงยึดบริเวณรอยต่อระหว่างผิววัสดุกับสารยึดเรซินของชั้น  
ตัวอย่างแต่ละชั้นในกลุ่มทดลองตามลำดับ

กลุ่มที่	ลำดับชั้น ตัวอย่าง	ค่าความแข็งแรงดึง (MPa)	ชนิดของการแตกหัก
1 Base metal alloys Super-Bond	1	25.55	R
	2	22.78	R, R/PMMA
	3	23.51	R, R/PMMA
	4	23.76	R, R/PMMA
	5	17.76	R, R/PMMA
	6	17.74	R, R/PMMA
	7	25.24	R, R/PMMA
	8	23.25	R, R/PMMA
	9	18.75	R, R/PMMA
	10	21.67	R, R/PMMA
2 Ceremic Super-Bond	1	12.07	A,R
	2	9.32	A,R
	3	9.01	A,R
	4	12.47	A,R
	5	8.12	A,R
	6	10.22	A,R
	7	11.44	A,R
	8	9.95	A,R
	9	11.13	A,R
	10	11.14	A,R

กลุ่มที่	ลำดับชั้น ตัวอย่าง	ค่าความแข็งแรงดึง (MPa)	ชนิดของการแตกหัก
3 Resin composite Super-Bond	1	18.07	R, R/PMMA
	2	18.42	R, R/PMMA
	3	23.23	R, R/PMMA
	4	19.21	R, R/PMMA
	5	24.69	R, R/PMMA
	6	25.15	R, R/PMMA
	7	24.05	R, R/PMMA
	8	15.76	R, R/PMMA
	9	19.88	R, R/PMMA
	10	15.34	R, R/PMMA
4 Experimental material Super-Bond	1	15.97	R, R/PMMA
	2	20.37	R
	3	33.75	R
	4	21.41	R, R/PMMA
	5	18.50	R, R/PMMA
	6	19.77	R, R/PMMA
	7	21.98	R, R/PMMA
	8	16.01	R, R/PMMA
	9	20.79	R
	10	19.94	R, R/PMMA

กลุ่มที่	ลำดับชั้น ตัวอย่าง	ค่าความแข็งแรงดึง (MPa)	ชนิดของการแตกหัก
5 Base metal alloys All Bond 2	1	1.58	A
	2	1.65	A
	3	1.89	A
	4	3.01	A
	5	1.73	A
	6	2.19	A
	7	1.91	A
	8	3.93	A
	9	1.53	A
	10	1.77	A
6 Ceramic All Bond 2	1	1.44	A
	2	1.50	A
	3	2.40	A
	4	1.47	A
	5	1.21	A
	6	1.15	A
	7	.89	A
	8	1.04	A
	9	1.27	A
	10	1.42	A

กลุ่มที่	ลำดับชั้น ตัวอย่าง	ค่าความแข็งแรงดึง (MPa)	ชนิดของการแตกหัก
7 Resin composite All Bond 2	1	8.71	A
	2	7.51	A
	3	11.14	A
	4	7.15	A
	5	13.38	A
	6	9.05	A
	7	6.63	A
	8	11.74	A
	9	9.65	A
	10	11.78	A
8 Experimental material All Bond 2	1	9.65	R, A
	2	13.85	R
	3	18.37	R
	4	10.25	R, A
	5	10.16	R, A
	6	9.77	R, A
	7	10.91	R, A
	8	14.89	R, A
	9	10.56	R, A
	10	11.12	R, A

ตาราง ง การทดสอบค่าความแข็งแรงดึงยึดบริเวณรอยต่อระหว่างผิววัสดุบูรณะทุกกลุ่มกับเรซินซีเมนต์ทั้ง 2 กลุ่ม ด้วยการวิเคราะห์สถิติโดยใช้การวิเคราะห์ความแปรปรวนแบบจำแนกสองทาง (two-way ANOVA)

### Univariate Analysis of Variance

#### Between-Subjects Factors

		Value Label	N
cement	1	superbond	40
	2	all-bond	40
material	0	metal	20
	1	ceramic	20
	2	composite	20
	3	experimental material	20

#### Levene's Test of Equality of Error Variances<sup>a</sup>

Dependent Variable: strength

F	df1	df2	Sig.
3.972	7	72	.001

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+cement+material+cement \* material

#### Tests of Between-Subjects Effects

Dependent Variable: strength

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4590.260 <sup>a</sup>	7	655.751	80.485	.000
Intercept	12113.534	1	12113.534	1486.775	.000
cement	2903.086	1	2903.086	356.315	.000
material	1265.010	3	421.670	51.754	.000
cement * material	422.164	3	140.721	17.272	.000
Error	586.622	72	8.148		
Total	17290.416	80			
Corrected Total	5176.882	79			

a. R Squared = .887 (Adjusted R Squared = .876)

ตาราง ๑ การทดสอบค่าความแข็งแรงดัดยึดบริเวณรอยต่อระหว่างผิววัสดุบูรณะทุกกลุ่มกับเรซินซีเมนต์ทั้ง 2 กลุ่ม ด้วยการวิเคราะห์สถิติโดยใช้การวิเคราะห์ความแปรปรวนแบบจำแนกทางเดียว (one-way ANOVA)

#### Descriptive Statistics

group	N	Minimum	Maximum	Mean	Std. Deviation
1 strength	10	17.74	25.55	22.0010	2.93343
Valid N (listwise)	10				
2 strength	10	8.12	12.47	10.4870	1.40206
Valid N (listwise)	10				
3 strength	10	15.34	25.15	20.3800	3.65852
Valid N (listwise)	10				
4 strength	10	15.94	33.75	20.4490	5.21391
Valid N (listwise)	10				
5 strength	10	1.53	3.93	2.1190	.76777
Valid N (listwise)	10				
6 strength	10	.89	2.40	1.3790	.41065
Valid N (listwise)	10				
7 strength	10	6.63	13.38	9.6740	2.26632
Valid N (listwise)	10				
8 strength	10	9.65	18.37	11.9530	2.85402
Valid N (listwise)	10				

Group	Resin cement	Restorative material
1	Super-Bond	Base metal alloys
2	Super-Bond	Ceramic
3	Super-Bond	Resin composite
4	Super-Bond	Experimental material
5	All-Bond2&Duo-Link	Base metal alloys
6	All-Bond2&Duo-Link	Ceramic
7	All-Bond2&Duo-Link	Resin composite
8	All-Bond2&Duo-Link	Experimental material



การทดสอบการกระจายตัวของข้อมูลค่าความแข็งแรงดึงยึดของวัสดุบูรณะกับสารยึดเรซินในแต่ละกลุ่ม

One-Sample Kolmogorov-Smirnov Test

group			strength
1	N		10
	Normal Parameters <sup>a,b</sup>	Mean	22.0010
		Std. Deviation	2.93343
	Most Extreme Differences	Absolute	.205
		Positive	.166
		Negative	-.205
	Kolmogorov-Smirnov Z		.647
Asymp. Sig. (2-tailed)		.796	
2	N		10
	Normal Parameters <sup>a,b</sup>	Mean	10.4870
		Std. Deviation	1.40206
	Most Extreme Differences	Absolute	.177
		Positive	.097
		Negative	-.177
	Kolmogorov-Smirnov Z		.559
Asymp. Sig. (2-tailed)		.914	
3	N		10
	Normal Parameters <sup>a,b</sup>	Mean	20.3800
		Std. Deviation	3.65852
	Most Extreme Differences	Absolute	.182
		Positive	.154
		Negative	-.182
	Kolmogorov-Smirnov Z		.576
Asymp. Sig. (2-tailed)		.895	
4	N		10
	Normal Parameters <sup>a,b</sup>	Mean	20.4490
		Std. Deviation	5.21391
	Most Extreme Differences	Absolute	.285
		Positive	.285
		Negative	-.194
	Kolmogorov-Smirnov Z		.900
Asymp. Sig. (2-tailed)		.393	
5	N		10
	Normal Parameters <sup>a,b</sup>	Mean	2.1190
		Std. Deviation	.76777
	Most Extreme Differences	Absolute	.307
		Positive	.307
		Negative	-.221
	Kolmogorov-Smirnov Z		.972
Asymp. Sig. (2-tailed)		.302	
6	N		10
	Normal Parameters <sup>a,b</sup>	Mean	1.3790
		Std. Deviation	.41065
	Most Extreme Differences	Absolute	.284
		Positive	.284
		Negative	-.117
	Kolmogorov-Smirnov Z		.898
Asymp. Sig. (2-tailed)		.395	
7	N		10
	Normal Parameters <sup>a,b</sup>	Mean	9.6740
		Std. Deviation	2.26632
	Most Extreme Differences	Absolute	.141
		Positive	.130
		Negative	-.141
	Kolmogorov-Smirnov Z		.446
Asymp. Sig. (2-tailed)		.989	
8	N		10
	Normal Parameters <sup>a,b</sup>	Mean	11.9530
		Std. Deviation	2.85402
	Most Extreme Differences	Absolute	.315
		Positive	.315
		Negative	-.210
	Kolmogorov-Smirnov Z		.996
Asymp. Sig. (2-tailed)		.275	

a. Test distribution is Normal.

b. Calculated from data.

แสดงการทดสอบความเท่ากันของความแปรปรวนของข้อมูลค่าความแข็งแรงดึงยึดของวัสดุบุรณะ  
กับสารยึดเรซินในแต่ละกลุ่ม

#### Test of Homogeneity of Variances

strength

Levene Statistic	df1	df2	Sig.
3.972	7	72	.001

แสดงการทดสอบข้อมูลค่าเฉลี่ยความแข็งแรงดึงยึดด้วยการวิเคราะห์การแปรปรวนแบบทางเดียว

#### ANOVA

strength

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4590.260	7	655.751	80.485	.000
Within Groups	586.622	72	8.148		
Total	5176.882	79			

#### Robust Tests of Equality of Means

strength

	Statistic <sup>a</sup>	df1	df2	Sig.
Brown-Forsythe	80.485	7	35.105	.000

a. Asymptotically F distributed.

แสดงการทดสอบข้อมูลค่าเฉลี่ยความแข็งแรงดึงยึดด้วยการเปรียบเทียบเชิงซ้อนแบบแทมเฮน  
(Tamhane's multiple comparison)

## Multiple Comparisons

Dependent Variable: strength

Tamhane

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	11.51400*	1.02814	.000	7.4985	15.5295
	3	1.62100	1.48290	1.000	-3.8352	7.0772
	4	1.55200	1.89182	1.000	-5.6778	8.7818
	5	19.88200*	.95888	.000	15.8845	23.8795
	6	20.62200*	.93668	.000	16.5973	24.6467
	7	12.32700*	1.17223	.000	8.0019	16.6521
	8	10.04800*	1.29424	.000	5.3230	14.7730
2	1	-11.51400*	1.02814	.000	-15.5295	-7.4985
	3	-9.89300*	1.23897	.000	-14.8696	-4.9164
	4	-9.96200*	1.70736	.004	-17.0649	-2.8591
	5	8.36800*	.50550	.000	6.4293	10.3067
	6	9.10800*	.46200	.000	7.1997	11.0163
	7	.81300	.84273	1.000	-2.3689	3.9949
	8	-1.46600	1.00555	.994	-5.3789	2.4469
3	1	-1.62100	1.48290	1.000	-7.0772	3.8352
	2	9.89300*	1.23897	.000	4.9164	14.8696
	4	-.06900	2.01419	1.000	-7.5664	7.4284
	5	18.26100*	1.18213	.000	13.2617	23.2603
	6	19.00100*	1.16419	.000	13.9743	24.0277
	7	10.70600*	1.36092	.000	5.5684	15.8436
	8	8.42700*	1.46732	.001	3.0172	13.8368
4	1	-1.55200	1.89182	1.000	-8.7818	5.6778
	2	9.96200*	1.70736	.004	2.8591	17.0649
	3	.06900	2.01419	1.000	-7.4284	7.5664
	5	18.33000*	1.66656	.000	11.1792	25.4808
	6	19.07000*	1.65389	.000	11.8961	26.2439
	7	10.77500*	1.79781	.002	3.6655	17.8845
	8	8.49600*	1.87964	.013	1.2868	15.7052
5	1	-19.88200*	.95888	.000	-23.8795	-15.8845
	2	-8.36800*	.50550	.000	-10.3067	-6.4293
	3	-18.26100*	1.18213	.000	-23.2603	-13.2617
	4	-18.33000*	1.66656	.000	-25.4808	-11.1792
	6	.74000	.27534	.397	-.3193	1.7993
	7	-7.55500*	.75668	.000	-10.6366	-4.4734
	8	-9.83400*	.93461	.000	-13.7220	-5.9460
6	1	-20.62200*	.93668	.000	-24.6467	-16.5973
	2	-9.10800*	.46200	.000	-11.0163	-7.1997
	3	-19.00100*	1.16419	.000	-24.0277	-13.9743
	4	-19.07000*	1.65389	.000	-26.2439	-11.8961
	5	-.74000	.27534	.397	-1.7993	.3193
	7	-8.29500*	.72834	.000	-11.3971	-5.1929
	8	-10.57400*	.91182	.000	-14.4890	-6.6590
7	1	-12.32700*	1.17223	.000	-16.6521	-8.0019
	2	-.81300	.84273	1.000	-3.9949	2.3689
	3	-10.70600*	1.36092	.000	-15.8436	-5.5684
	4	-10.77500*	1.79781	.002	-17.8845	-3.6655
	5	7.55500*	.75668	.000	4.4734	10.6366
	6	8.29500*	.72834	.000	5.1929	11.3971
	8	-2.27900	1.15246	.845	-6.5223	1.9643
8	1	-10.04800*	1.29424	.000	-14.7730	-5.3230
	2	1.46600	1.00555	.994	-2.4469	5.3789
	3	-8.42700*	1.46732	.001	-13.8368	-3.0172
	4	-8.49600*	1.87964	.013	-15.7052	-1.2868
	5	9.83400*	.93461	.000	5.9460	13.7220
	6	10.57400*	.91182	.000	6.6590	14.4890
	7	2.27900	1.15246	.845	-1.9643	6.5223

\*. The mean difference is significant at the .05 level.

## ประวัติผู้เขียนวิทยานิพนธ์

นางสาวพัชรี สันติวราพันธ์ เกิดที่กรุงเทพมหานคร เมื่อวันที่ 25 มกราคม พ.ศ. 2521 สัญชาติไทย สำเร็จการศึกษาระดับปริญญาตรี ทันตแพทยศาสตรบัณฑิต พ.ศ.2545 จาก คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย เคยรับราชการตำแหน่ง ทันตแพทย์ ระดับ 4 หัวหน้าฝ่ายทันตกรรม ประจำโรงพยาบาลอำเภอตากดี จังหวัดนครสวรรค์ พ.ศ. 2545-2547 ปัจจุบันได้ลาออกจากราชการเพื่อมาศึกษาต่อในหลักสูตร ปริญญาวิทยาศาสตรมหาบัณฑิต สาขาวิชา ทันตกรรมประดิษฐ์ คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย