2690 **Surface Luster of Indirect Composite Resins after Toothbrush Wear.** J. CRUZ*, V. BUI, A. KOBASHIGAWA, and E. SHELLARD, Kerr Corporation, USA

The purpose of this study is to evaluate the surface luster of indirect composite resins after toothbrush wear. The equilibrium gloss of an experimental submicron particle size composite with median particle size 0.4 microns. Belleglass Experimental (B.G. Exp.), was determined with existing products. Belleglass Enamel (B.G. Enam.) and Cristobal+ Incisal (CB+Inc.) as controls. Toothbrush wear testing was conducted as previously described (Abst #535, IADR 2001) and 60° gloss measurements were determined over a 15 hr. period. A set of three samples were tested for each material. The samples were conditioned for 14 days in 37° C. water and ultrasonically and steamed cleaned before each gloss measurement. The mean equilibrium gloss and s.d. were reported.

Results: The gloss as a function of tooth brushing time is described in equation 1: 1) Y=a + be -x Where: Y=60° Gloss (%), a=equilibrium gloss (%), b=constant and x=time (hrs). The attached table summarizes the mean equilibrium gloss (a) determined after 15 hrs. of toothbrushing.

Material	Initial Gloss (%)	Equilibrium Gloss (%)
B.G. Exp.	65 (4)	45 (3)
B.G. Enamel	65 (2)	16 (1)
CB+ Inc.	65 (8)	15 (1)

ANOVA analysis of the data ($p < 0.05$) indicate that the equilibrium gloss of B.G. Exp. after brushing is significantly higher than the controls B.G. Enam. and CB+ Inc., which were not statistically different from each other. Conclusion: The stable higher surface gloss of the Belleglass Experimental after toothbrushing suggests that a clinically stable high luster surface by a hybrid composite resin may be possible.

2691 **Effect of Finishing Techniques on the Hardness of Composites with Different Fillers.** P.K. BLASER*, V.V. GORDAN, C. SHEN, and E. MONDRAGON, University of Florida, USA

Objectives: This in vitro study tested the following hypotheses: the surface hardness of resin-based composite (RBC) can be affected by different finishing methods, and different filler components of resin-based composite. Methods: Four disks each (5mm thick x 16.5mm dia) were prepared for the following materials: small particle RBC (Z-250, 3M/ESPE Dental Products), microfil RBC (Durafill, Heraeus-Kulzer, Inc.), and unfilled resin (same batch of resin for Z-250, 3M/ESPE Dental Products). The disks were polymerized through a clear .051mm thick strip (Mylarâ) using a light-curing unit (Demetron, Division of Kerr Corporation) and were tested for baseline Knoop Hardness (KHN) on the surface exposed to the light. One row of indentations evenly spaced at 0.5mm was made approximately 2mm from the edge of the specimen along the diameter through the centroid. A second row was made perpendicular to the first one. Total number of indentation was 50 per disk. The disks were then reduced approximately 1.5mm through 320-1200 grit SiC papers under two different conditions: dry or wet finishing (n=2). New indentations were then made as described for baseline surfaces. Results: The table shows the mean±SD of the surfaces before and after finishing. ANOVA shows that filler component and finishing technique significantly affected the hardness values ($p<0.0001$). Duncan's multiple range tests rank the order of influence as follows: small particle> microfilled>unfilled, dry finishing>wet finishing, and finished surface >baseline surface.

	Small particle (MPa)	Microfil (MPa)	Unfilled (MPa)
Baseline	575±60	145±15	119±15
Wet finishing	628±78	206±23	128±9
Dry finishing	721±60	210±22	130±5

Conclusions: Finishing the surface of RBC and UR increased the surface hardness of these materials. Although dry finishing presented significantly harder surface than wet finishing statistically, the differences in the mean hardness values do not appear clinically significant. The filler component of RBC significantly influenced the hardness of the materials.

2692 **Surface Roughness of Resin Composites After Finishing and Polishing Procedures.** F.P. MARSOLA*, Universidade de São Paulo, Brazil, and H. NAGEM FILHO, Universidade do Sagrado Coração, Brazil

Finishing and polishing of resin composites are important steps in the restorative dentistry. A highly polished surface minimizes plaque accumulation, gingival irritation, poor esthetic and color change. Thereby, the smoothness of the restoration is of utmost importance for its success. Objectives: The purpose of this study was to investigate the average surface roughness (Ra, mm) of seven composites with different resin types either set against polyester strips, finished with diamond burs or polished with aluminum oxide disc. Methods: Seven composites (Filtek Z250, Definite, Alert, Suprafill, Solitaire, Fill Magic, Surefill) and two polishing systems (diamond burs and Sof-lex discs) were used. One hundred and twenty six conical specimens of each material were prepared in stainless steel molds against a polyester strip and polymerized for 60s. Forty-two of them remained intact and were used as controls. Each half of the remained samples was polished with either diamond burs or aluminum-oxide discs. The average surface roughness was calculated for each sample by a portable surface finish measurer with a resolution of 0.01mm. Results: The results showed no statistical difference in average surface roughness (Ra, mm) between the polyester strip and aluminum oxide discs ($p > 0.05$). However, finishing with diamond burs showed a statistically higher average roughness for all composites ($p < 0.05$). No statistical differences were detected among materials ($p > 0.05$). Conclusions: The Sof-lex discs and the polyester strip provided smoother surfaces than the diamond burs for all the resin composites evaluated. All of the composites studied displayed similar roughness when treated with a similar polishing technique.

2693 **Surface Roughness of a Flowable Composite Finished with Various Abrasives.** A.I. ZEEVI*, and A.L. NEME, University of Detroit Mercy, USA

New clinical applications are being rapidly developed for flowable resin composites. Because of this, additional information on finishing techniques for flowable materials is necessary for the clinician. Objective: The purpose of this investigation was to determine the effect of four different finishing systems on the surface roughness of a flowable resin composite. Methods: Twenty samples measuring 8mm in diameter and 3mm deep were prepared in acrylic molds for the flowable composite Filtek Flow against a Mylar strip to create a baseline surface. Prior to finishing each sample was measured for surface roughness (Ra) using a SurfanalyzerÒ 5400 profilometer. Each sample was rotated 120° between the three readings on each sample. Five samples were finished with each of the four finishing systems (Axis, Enhance, Occlusal Brush, and One Gloss). A single operator finished each surface using an electrical handpiece at 7000 rpm for 30 seconds. Samples were kept in 100% humidity at all times other than finishing and roughness measuring. Data were analyzed using ANOVA and Tukey HSD at a=0.05. Results: No significant difference was observed among the four different finishing systems. There was, however, a significant difference between baseline surface roughness (0.066m m) and finished surfaces (A=0.151m m, E=0.197m m, B=0.196m m, G=0.195m m). Conclusions: In conclusion, among the finishing systems there was no statistically significant difference in surface roughness for the flowable composite studied. Funded in part by 3M ESPE.

2694 **Surface Roughness of Resin Composite Materials Finished with Two F[illegible] Systems.** N.K. SHUKAIRY, D.C. HOELSCHER*, and A.L. NEME, University [illegible]it Mercy, USA

Hybrid, microfilled, and packable composites are currently available. Understanding va[illegible] in surface roughness of these materials can aid in selecting materials and finishing methods. Objec[illegible]e purpose of this investigation was to evaluate the effect of two finishing systems on various types of composite materials. Methods: Specimens (n=60), 8 mm in diameter and 3 mm deep, were fabricated using 2 hybrid (Tetric, Filtek Z-250), 2 microfilled (Heliomolar, Filtek A-110), and 2 packable composites (Heliomolar HB, Filtek P-60) cured against a Mylar strip to create a baseline surface. Five Mylar surfaces for each material were analyzed using a SurfanalyzerÒ 5400 profilometer to obtain surface roughness values. Five surfaces of each material were finished with one of two finishing systems (Astropol rubber finishing discs, Sof-Lex sandpaper discs) and surface roughness was measured. The data (Ra) were analyzed by two-way ANOVA and Tukey HSD at a=0.05. Results: Significant differences were observed among materials and between finishing methods with a significant interaction between material and finishing. No significant difference in surface roughness was determined among baseline surfaces. The Mylar surface was significantly smoother than the sandpaper finish for T, B, and Z and significantly smoother than the rubber finish for T and H ($p<0.05$). Sandpaper finish on B yielded a significantly rougher surface than all material/finishing combinations except T ($p<0.05$). B yielded significant differences between finishing systems; rubber=0.106mm, sandpaper=0.171mm. Conclusion: In conclusion, there were no significant differences among the hybrid, microfilled and packable materials at baseline or following treatment with rubber finishing disc. Funded in part by Ivoclar North America.

2695 **Surface hardness of dental composites after aging in water.** J. MARTOS*1, W. OSINAGA1, M. TOLEDANO2, and R. OSORIO2, 1 Federal University of Pelotas, Brazil, 2 University of Granada, Spain

Objectives: To measure the surface hardness of four resin composites: Alert (Jeneric-Pentron), Artglass (Kulzer), Belleglass (Kerr) and FiltekZ250 (3M) after aging in distilled water. Methods: Five discs (8x 2.5 mm) of each material were prepared and polymerized: Alert and FiltekZ250 - direct visible light polymerization during 120 s at 400 mW/cm2 (KM-100R-DMC Co.); Artglass - intense visible light pulsed in unit UniX S(Heraeus-Kulzer) 520 nm/20 Hz during 180 s; Belleglass - photopolymerization with unit Tekliteat 500 nm during 60 s and post-cured with HP Curing Unit to 138ºC under pressure (29 lb/pol2) for 20 min.. The specimens were stored in 10 ml of water distilled at 37ºC in different periods. Five knoop hardness measurements (KHN) were taken on each of the surfaces with a Miniload Hardness Tester(Ernst Leitz) (load: 50 gr; for 30 s). ANOVA and multiple comparisons tests were performed ($P<0.05$). Results: Mean KHN and (SD) are displayed in the table. Means with the same letter are statistically similar, * shows differences among storage periods. Conclusions: Mean KHN were lower for Art-glass than for the rest of the materials, Alert and Belleglass obtained the higher values. In general, KHN decreased with the storage time, except for Artglass that showed no variation. (CICYT. Grant#MAT2001-2843-C02).

	Alert	Belleglass	FiltekZ250	Artglass
0h	1726.2±180 a	1579.9±217 ab*	1486.2±141 bc*	1093.2±202 c
12h	1885.4±299 a	1541.4±184 a*	1476.7±149 b*	1015.4±152 c
48h	1715.3±216 a	1321.3±262 a	1255.0±101 b	984.6±163 c
7d	1568.0±172 a*	1169.8±242 b	1144.6±196 bc	951.9±129 c
30d	1707.4±322 a	1256.3±208 b	1101.6±125 bc	956.2±108 c
60d	1524.6±201 a*	1211.5±76 a	1164.6±133 b	945.4±112 c

2696 **Surface microhardness & roughness of flowable composite resins after a 196-day-storage in aqueous media.** J. MUNACK*1, V. HEY1, S. DOGAN1, G. LEYHAUSEN1, and W. GEURTSEN, 1 Medical University Hannover, Germany

Objectives: To evaluate surface characteristics of seven flowable (f) or condensable (c) conventional (cv) and polyacid-modified (pm) composite resins after a 196-day-storage in four artificial saliva solutions. Methods: Each 75 specimens were made from the following composite resins: Flowline (f, cv)=I, Tetric Flow (f, cv)=II, Revolcin Flow (f, cv)=III, Dyract flow (f, pm)=IV, Dyract AP (c, pm)=V, Tetric Ceram (c, cv)=VI, Revolcin Fil (c, cv)=VII according to the manufacturers´ instructions. 24h after polymerization, each 3 randomly selected samples were stored in 5 mL of one of the following media: distilled water, acidic buffer/pH 4.2, neutral buffer/pH 7.0, and neutral buffer supplemented with 1.6 u/mL porcine liver esterase. Each assay was repeated five times. Dry-stored specimens of each material served as controls. Surface microhardness (Vickers) and surface roughness (Ra) of 5 randomly selected samples per medium and composite were determined prior to wet storage (baseline), and then after 24, 96, and 144h, 8, 14, 28, 56, 112, and 196 days. Results were statistically evaluated by an ANOVA using Scheffe-tests ($p < 0.05$). Results: Vickers hardness of all materials except for product I was significantly reduced due to storage in artificial salivas in comparison to baseline and to dry-stored controls ($p < 0.05$). Surface hardness of flowable materials was significantly lower in comparison to condensable composites ($p < 0.05$). In addition, all flowable cv-composites revealed a significantly higher Vickers hardness compared to the flowable pm-material. No significant changes of surface roughness dependent on storage condition or time were observed ($p < 0.05$). Conclusions: From our results we conclude that the surface microhardness of flowable composite resins, specifically of the tested poly-acid modified material, is significantly lower in comparison to condensable composites.

2697 **Effects of Bleach on Color and Surface Roughness of Composites.** A.M. DEBUYL*, K.L. O'KEEFE, L. ROEDER, R. PARAVINA, and J.M. POWERS, UT-Houston Health Science Center-Dental Branch, USA

This study determined the effects of 10% (OP10) and 20% carbamide peroxide (OP20, Opalescence) and 5% hydrogen peroxide (WS, Crest Whitestrips) bleach on the color and surface roughness of three resin composites. Fifteen, 10-mm diameter by 2-mm thick specimens each of a flowable (Tetric Flow, Ivoclar Vivadent), restorative (Tetric Ceram) and an indirect composite (Targis 99) were fabricated. Color (CIE L*a*b*) and surface roughness (Ra) measurements were made before and after a two-week bleaching protocol. WS was applied for 2, one-half hour increments twice a day for 2 weeks. OP10 and OP20 were applied for 6-hour periods for a period of 2 weeks. Specimens were stored at 37° C and 100% humidity between treatments. Color changes (D E*) were measured using a reflection spectrophotometer and Ra was measured using a profilometer. D E* and D Ra are listed below. Means (n=5) were compared using ANOVA.

	Tetric Flow		Tetric Ceram		Targis	
	Δ E*	Δ Ra	Δ E*	Δ Ra	Δ E*	Δ Ra
WS	1.3	.005	0.9	.005	0.5	.007
OP 10	1.3	.005	1.0	.008	0.4	.005
OP 20	1.6	.013	1.4	.016	0.4	.014

Tukey-Kramer intervals ($p<0.05$) for D E* for both bleaches and composites were 0.18 and for D Ra for both bleaches and composites were 0.002 mm. Although pre- and post-treatment results showed no visually perceptible changes in color (D E* <3.3), there were statistically significant color differences among bleaches and composites, with more color change occurring with stronger bleach and with the least filled composite (Tetric Flow). The surface roughness of the specimens was consistently rougher than before treatment, with OP20 showing highest surface roughness change. The flowable composite was consistently affected more by the bleaching materials and the laboratory composite was the least affected. WS and OP10 showed similar results with each composite. Supported by NIH Training Grant T35DE07252-0[illegible]. Arnaud.m.debuyl@uth.tmc.edu.