# [redacted]merization rate and the degree of conversion of composite resins by different light sources

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**I. Objectives**

The clinical performance of light polymerized composite resins is greatly influenced by the quality of the light curing unit used. Commonly used halogen light curing units(LCUs) have some specific drawbacks such as decreasing light output with time. To overcome this, the blue LED LCUs are newly developed and introduced. The purpose of this study was to observe the reaction kinetics and the degree of polymerization of composite resins when cured by different light sources and to evaluate the effectiveness of the blue LED LCUs compared with conventional halogen LCUs.

**II. Materials and Methods**

In order to evaluate the effectiveness of LCUs, two experiments were performed. First, thermal analysis was performed by a differential scanning calorimeter(DSC). The LED LCU(Elipar Freelight, 3M, ESPE, U.S.A., 320㎽/㎠) and the conventional halogen LCU(XL3000, 3M, St. Paul., U.S.A., 400㎽/㎠) were used in this study for curing three composite resins(SureFil, Z-250, AEliteFLO). The effectiveness of cure of soft-start regimen in LED LCUs(Elipar Freelight Exponential mode) was also investigated. DSC curves were obtained for 10 minutes at 37℃(in air) isothermal condition. The heat of cure(-⊿H, J/g), maximum rate of heat output(watt/g) and peak heat flow time(sec) of composite resins by different light curing units were obtained from the DSC curves.

Second, the degree of conversion(%) were obtained in the composite resins cured according to the above curing mode with a Fourier Transform Infrared Spectrometer(FTIR). Statistical analysis was performed by two-way ANOVA test at 95% levels of confidence and Duncan's procedure for multiple comparison.

**III. Results**

The results of this study were as follows.

1. The heat of cure was not statistically different among the LCUs($p>0.05$).
2. The rate of polymerization evaluated by the maximum rate of heat output and the peak heat flow time showed statistically significant difference among the LCUs ($p<0.05$). The composites cured by the LED(Exp) LCUs were statistically more slowly polymerized than by the halogen LCU and by the LED(Std) LCU.
3. The quantity of heat of the halogen LCU was significantly greater than that of the LED LCU($p<0.05$).
4. The composite resin groups cured by the LED(Exp) LCUs had significantly higher degree of conversion(%) than by the halogen LCU and by the LED(Std) LCU ($p=0.0002$).
5. The heat of cure(J/g) and the degree of conversion(%) of composite resins decreased with increasing filler content(AEliteFLO>Z-250>SureFi). The rate of polymerization evaluated by the peak heat flow time were slower in AEliteFLO than in SureFil and in Z-250($p<0.0001$).

**IV. Conclusions**

From this DSC study(thermal analysis), no statistically significant differences in the heat of cure(J/g) were found between samples cured with the LED LCU or the halogen LCU, respectively, although the light intensity of the LED LCU(320㎽/㎠) was lower than that of the halogen LCU(400㎽/㎠). The composites cured by the LED(Exp) LCUs were statistically more slowly polymerized than

by the halogen LCU and the LED(Std) LCU. The effectiveness of cure of soft-start regimen in LED LCUs(Elipar Freelight [redacted]ode) was found in the degree of conversion obtained from the FTIR study. However, further mechanical tests and [redacted] are required to judge the LED LCU fully.

# Microshearbond strength to different surfaces of dentin under simulated pulpal pressure

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**I. Objectives**

The purpose of this in vitro study was to measure and compare the in vitro micro shear bond strengths of the following dentin bonding systems to different dentin surfaces under simulated pulpal pressure.

**II. Materials and Methods**

Occlusal surfaces of 180 extracted human molars were prepared to expose the dentin surface in perpendicular to axis of tooth. Teeth were randomly assigned to 3 equal groups and subdivided into 4 equal groups. 4 adhesive systems(All Bond 2, SEbond, AdheSE, Prompt L-Pop) were used in this study. The dentin surfaces were treated with the bonding systems mentioned above, and resin composite cylinders were built up under simulated pulpal pressure when saline(Group II) or diluted bovine serum(Group III) was used as the pulpal fluid. As a control, the same procedures were done in the dried dentin surfaces(Group I). After one day of storage in water, micro shear bond strengths were measured using EZ tester (shimadzu, Japan). The data were statistically analyzed using two way ANOVA for the effect interrelation between different dentin conditions and materials. Within the experimental group, Kruskal-Wallis one way ANOVA and Student-Newman-Keuls method were used for the effect of dentin condition in subdivide groups on microshear bond strength.

**III. Results**

Group I showed significant higher microshear bond strength than Group II and III statistically($P<0.05$). SEbond and AdheSE showed no difference among the different dentin condition. In Prompt L-Pop, Group I, III showed higher microshear bond strength than Group II.

**IV. Conclusions**

Dried dentin surface showed higher micro-shear bond strengths than the dentin surfaces which simulated pulpal pressure using saline or diluted bovine serum.