1591 Chemical Degradation of Dental Composite Resins after Extract Treatments

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Objectives: To evaluate UV absorbance and potassium permanganate consumption of dental composite resins according to different extract treatments.

Methods: Composite-resin specimens (15 ± 0.1 mm in diameter and 1.0 ± 0.1 mm in thickness) were light-cured (20s) on each side as indicated by the manufacturers for each of four composite resins (classified Class 2, Group 1 of Type 2 by ISO 4049:2000(E)): AELITE™ Universal Light-Cured (Bisco, Schaumberg, IL USA(B)), GRADIA DIRECT ANTERIOR (GC Corp., Tokyo, Japan(G)), DenFil™ (Vericom, Anyang, Korea(V)), and Filtek™ Z350 (3M ESPE, St. Paul, MN USA(M)). Each specimen was stored in distilled water (20mL/4g) at four different temperatures and times according to different extract conditions: (121 ± 2°C, 1 ± 0.2 hr), (70 ± 2°C, 24 ± 2 hr), (50 ± 2°C, 72 ± 2 hr), and (37 ± 2°C, 72 ± 2 hr), respectively. For evaluating UV absorbance, they were measured using a UV-vis spectrophotometer (WPA S2100, Biochrom Ltd., Cambridge, UK). For evaluating potassium-permanganate consumption, 20mL resin extract was added to 20mL 0.002M KMnO₄ and 1mL dil.H₂SO₄. This mixture was boiled (3min), and KI was added. The mixture was then back-titrated with 0.01M sodium thiosulfate. Differences in potassium-permanganate consumption between control and test groups (KMnO₄-test) were calculated (modified Method of dissolved oxygen (DO) and chemical oxygen demand (COD) in environmental water analysis). The control consisted of distilled water instead of the eluted extract. The Results were statistically analyzed by Friedman Test and Kruskal-Wallis Test (p<0.05, n=5).

Results: Except extracts from G, there was a noticeable trend in increased absorbance as temperature and time increased (p<0.05). (37 ± 2°C and 72 ± 2 hr) were the best harmless condition to extract. All absorbencies of Extracts from G, however, produced the lowest peaks at below 0.100 which was favorable. The KMnO₄-test showed no apparent trend (p>0.05). (70 ± 2°C, 24 ± 2 hr) and (121 ± 2°C, 1 ± 0.2 hr) produced variable Results.

Conclusion: UV absorbance produced a notable trend except extracts from G: increased UV absorbance as temperature and time increased. The best nontoxic condition for extraction was (37 ± 2°C and 72 ± 2 hr). However, some materials produced inconsistent Results in KMnO₄-test.

Seq #185 - New Materials Development and Characterization II
2:00 PM-3:15 PM, Friday, 23 March 2007 Ernest N. Morial Convention Center Exhibit Hall I2-J