

Depth of Cure of Several Composite Restorative Materials

Purpose – To determine the depth of cure by measuring the relative Barcol hardness between the top and bottom surfaces of a molded disk of composite.

Materials – The following resin composites were tested: **Sonicfill A3** (Kerr Corporation, Lot # 557EN129), **QuiXX Universal Posterior Restorative** (DENTSPLY Caulk, Lot # 101006), and **Filtek Supreme Ultra A3 Body** (3M ESPE, Lot # N226744).

Methods – Discs (n=5) of composite 10 mm in diameter by between 2 and approximately 5 mm thick depending on the directions for use for the material were prepared in Teflon molds. The composites were cured with a **Demi** curing light (Kerr Corporation) that was evaluated by the MARC spectroradiometric system (BlueLight Analytics) to determine its output in mW/cm². The MARC system uses a 3.9 mm diameter NIST referenced CC3-UV cosine corrected detector simulating an accessible restoration. The MARC system was then used to establish a stand-off distance between the light tip and curable material that produced a sawtooth waveform output varying from 475-625 mW/cm² (stand-off distance = 8.4 mm) to simulate the output from a typical halogen curing light. A length of clear Tygon tubing (9.8 mm I.D.) was pressed onto the light tip and then cut off at a point 8.4 mm from the tip to produce a stand-off gage which allowed reproducible halogen lamp-like curing. Curing times were those specified by the composite manufacturer's instructions for their maximum single layer thickness. The curing time was 20 seconds for the three composites tested. After the light-cured specimens had been stored in 37°C water for 24 hours, three Barcol hardness measurements (Barcol Hardness Tester, GYZJ 935) were taken in the center of the top and bottom sides of each specimen. The hardness of the bottom surface was compared to the top surface (surface adjacent to the curing light) to determine the % similarity of hardness of the two surfaces: $\% = h_{\text{bot}}/h_{\text{top}} \times 100\%$. Means and standard deviations were determined.

Results –

Material	Average Thickness, mm	% Cure (SD)
Sonicfill A3	5.0	98 (1)
QuiXX	4.0	100 (0)
Filtek Supreme Ultra A3	2.1	100 (0)

Conclusions – The two bulk-fill composites, **Sonicfill A3** and **QuiXX Posterior Restorative**, were adequately cured at the maximum recommended depth when cured with the **Demi** curing light set to yield a sawtooth waveform output of 475-625 mW/cm² for a period of 20 seconds. **Filtek Supreme Ultra A3** was adequately cured when used according to manufacturer's directions for use.

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