

0156 Effect of Hydrophilicity on Water-Vapor Permeability of Dental Adhesive Films

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Objectives: Permeability of simplified dentin adhesives to dentinal fluid flow has been reported when they are bonded to vital human dentin. Such a phenomenon has been attributed to the increased hydrophilicity in these adhesives that lack non-solvated hydrophobic resin coatings. This study examined the water vapor permeability of thin resin films fabricated from resin blends of increasing hydrophilicity, as ranked by their Hoy's solubility parameter for hydrogen bonding (δ_h). **Methods:** 24-30 micron thick and 5.5 cm wide neat resin films were prepared from five experimental light-curable resins (N=10). Each film was mounted in a Fisher permeability cup with 8 g of water placed inside the cup. The experiments were conducted in a modified twin-outlet desiccator connected to a vacuum pump in one outlet to permit a continuous air flow to encourage water evaporation. Unmounted cups and cups mounted with Parafilm served as the positive and negative controls. Weight losses by water evaporation were measured with an analytical balance at 3, 6, 9, 24, 30, 48 h. Additional resin films were immersed in ammoniacal silver nitrate for 48 h to examine the presence of water channels in these films using TEM. **Results:** A significant correlation was observed between the 48 h cumulative water loss and the δ_h (P=0.05). TEM revealed water channels along film peripheries and silver grains of decreasing dimensions toward the film centers in Resins 3, 4 and 5.

	Resin 1	Resin 2	Resin 3	Resin 4	Resin 5
Mean cumulative water loss (g) after 48 h	0.40221	0.61966	0.82742	0.96912	1.34313
Hoy's δ_h , (J/cm ³) ^{1/2}	6.9	10.3	12.2	11.3	12.9

Conclusions: Hydrophilic dentin adhesives polymerized in thin films are prone to water loss by evaporation. This probably accounts for the water droplets seen on the surface of vital bonded dentin after application of simplified dentin adhesives.

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[Back to the Dental Materials: II - Adhesion-Other Program](#)

[Back to the IADR/AADR/CADR 83rd General Session \(March 9-12, 2005\)](#)