

Comprehensive properties of a novel fiber reinforced composite with a UEDMA-based resin matrix

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Abstrak

The traditional fiber reinforced composite (FRC) contains bisphenol A glycidyl methacrylate (bis-GMA) in the resin matrix, which is thought to have some disadvantages. This research aimed at replacing bis-GMA with another monomer-urethane dimethacrylate (UEDMA), with the desired properties for dental use still retained. Four groups were prepared with light-curing (n = 30), one Control group with a bis-GMA-based resin matrix and three experimental groups with UEDMA-based matrices (Exper 1, Exper 2 and Exper 3 with a varying UEDMA weight percentage). Specimens were stored in dry conditions for 24 h or in deionized water for 1, 3, 6 or 12 months prior to the tests. Water sorption (n = 6), Vicker's hardness (n = 6) and flexural properties (n = 6) after each storage time were investigated. Scanning electron microscopy (SEM) images were taken at the fracture sites after 3-point bending. All the results were statistically analyzed ($\alpha = 0.05$). The Exper 1 group exhibited the lowest weight increase after water storage among the experimental groups. As for dry conditions, 1- and 6-month storage, different resin matrix compositions made no significant difference to hardness, while for 3- and 12- month storage, "Control" possessed the highest hardness. The Control group's strength and modulus, Exper 1 and Exper 2's modulus were stable during water storage. Compared to other experimental groups, Exper 1 had the highest strength and modulus values with most of the storage times. SEM images showed relatively good adhesion between the fiber and the matrix. With all the tested properties considered, the Exper 1 group had superior performance among all the three experimental groups.