

Conversion of a NEW Monomer for Dental Resin Application

Abstract

Objective: The aim of this study was to investigate the degree of conversion and cross-linking of polyurethane dimethacrylate (PUDMA), derived from palm oil polyol, for dental resin application.

Methods: Polyurethane dimethacrylate was synthesized by reacting excess amount of Methylene diphenyl diisocyanate (MDI) with palm oil polyol. The resulting isocyanate polyurethane prepolymer was then acrylated using hydroxymethacrylate (HEMA). Fourier transform infrared spectroscopy was used to ascertain the formation of PUDMA, and to determine the degree of conversion (DC) of: I) PUDMA, II) Bis-GMA, III) Bis-EMA, IV) Bis-GMA/TEGDMA (3:1), V) Bis-GMA/TEGDMA(3:1)/Bis-EMA (3:1), VI) PUDMA/Bis-EMA (3:1), VII) Bis-GMA/TEGDMA(3:1)/PUDMA (1:1), and VIII) Bis-GMA/TEGDMA(3:1)/PUDMA/Bis-EMA (1-1-1). The photo initiator system Camphorquinone (CQ) and Ethyl-4-N,N-dimethylaminobenzoate (EDMAB) was used with ratio 0.25% and 0.75% by weight, respectively, for all monomers. The results were analyzed using one way ANOVA and Post Hoc Dunnett T3 for multiple comparisons.

Results: The FTIR spectrum of PUDMA showed that the isocyanate peaks was absent and appearance of urethane peak. The results of degree of conversion showed that, the unreacted C=C in Bis-GMA is more than 50 %, however, the DC of PUDMA is 63% with cross linking 0.4. The resin systems which contain PUDMA showed higher DC and cross-linking than that of other resin system.

Conclusions: The degree of conversion of PUDMA monomer is highly significant than Bis-GMA, with more cross-linking. The PUDMA could improve the DC and cross-linking of resin system. Therefore, PUDMA may have promising mechanical properties and biocompatibility.

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