NOVEL PHOTOCURABLE DENTAL FORMULATIONS DERIVED FROM NEW ACRYLIC SPIROORTHOCARBONATES MONOMER AND THE STUDY OF THEIR ANTI SHRINKING PROPERTIES IN RESTORATIVE DENTAL RESIN

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Shrinkage that occurs during the polymerization of the monomers is an important problem in applications that require high dimensional stability, such as in restorative dental resins¹, because the resins unprotected the area, which initially was covered, originating microleakage between the interface of the tooth and resin that subsequently can originate recurrent caries and low conversion² of acrylic double bonds³. It is well known that certain monomers like spiroorthocarbonates (SOCs) polymerize with volumetric expansion which may counteract the shrinkage that takes place during polymerization.⁴,⁵

In this work is discussed the synthesis of two novel antishrinking acrylic monomers SOC-IPDMA and SOCUDMA, also studies their performance in an acrylic dental composite. The SOC-IF-DMA was prepared in two stages, being the first a reaction between isophorone diisocyanate and diol spiroorthocarbonate (SOC DiOL)⁶, and in a second stage was added 2-Hydroxymethacrylate (HEMA). For the other monomer SOCUDMA was synthetized in a single stage, mixing the SOC-DIOL and 2-isocyanato ethyl methacrylate. The prepared compounds were characterized by FTIR, and ¹H and ¹³C NMR spectroscopy.

The SOC-IPDMA and SOCUDMA were photopolymerized in conjunction with the components of a conventional acrylic resin, which includes a mixture of diacrylate monomers [glycerolate bisphenol A dimethacrylate (BIS-GMA) / Urethane dimethacrylate (UDMA) / triethyleneglycol dimethacrylate (TEGDMA)] in 50/30/20 molar ratio).

In order to study the photocuring kinetics of these SOC’s monomers was used the real time FTIR spectroscopy (RT-FTIR). It was found that SOC’s promoted higher conversions than conventional acrylic monomer (BisGMA).

The shrinkage and stress that accompanies curing of dental composites was measured with a Polymerization Stress Tester device, where SOC’s were effective in reducing the shrinkage compared with Bis-GMA reference in the dental composites, moreover the lifetime of these materials also increases.

Keywords: acrylic spiroorthocarbonates monomers, shrinkage, restorative dental composites

References:


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