Water sorption of some experimental dental composites based on (modified-Bis-GMA) superior olygomers

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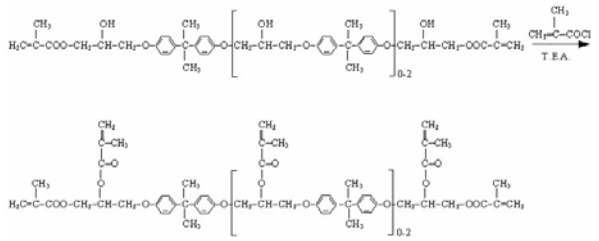
INTRODUCTION: Starting from the idea that the transformation of the hydroxy groups of the Bis-GMA_{0-2} superior olygomers in methacryloyl-oxy groups leads to the obtaining of olygomers with low viscosity and respectively to dental resin composites with low water sorption [1]. The paper studies the synthesis of modified Bis-GMA superior olygomers and their influence upon the water sorption of the corresponding experimental dental composites.

METHODS: 1.The synthesis of (modified Bis-GMA_{0-2}) superior olygomers. A mixture of olygomers called (modified Bis-$GMA)_{0-2}$ has been synthesized using the mixture of three components Bis-GMA_{0-2} having 83 mol % Bis-GMA_0 monomer- 2,2-bis[4-(2-hydroxy-3-methacryloyl-oxypropoxy)phenyl]-propane-, 16 mol % Bis-GMA_1 dimer, 1 mol % Bis-GMA_2 and methacryloyl chloride.



for n=0 Bis-GMA_0→(modified Bis-$GMA)_0$
n=1 Bis-GMA_1→ (modified Bis-$GMA)_1$
n=2 Bis-GMA_2→ (modified Bis-$GMA)_2$

Fig. 1 The synthesis of the (modified Bis-GMA)$_{0-2}$ olygomers

2.Obtaining of the experimental composite resins. A series of 5 light-curing experimental composites based on different monomer mixtures containing (Bis-$GMA)_{0-2}$ and (modified Bis-$GMA)_{0-2}$ superior olygomers with the diluting monomer, triethyleneglycole dimethacrylate (TEGDMA) have been prepared. The inorganic filler consisted of 90% silanized SrO glass and 10% silanized colloidal silica. The powder/liquid ratio was 4/1.

2. Determination of the water sorption

The method for evaluating the water sorption was in accordance to ISO 4049/2000.

RESULTS: Using IR spectroscopy, the total transformation of the Bis-GMA_{0-2} olygomers was demonstrated and the double bonds content of the reaction product, (Bis-GMA modified)$_{0-2}$, was determined as 22.7% $H_2C=C(CH_3)$ groups. By correlating the HPLC chromatogram of the reaction product (modified Bis-$GMA)_{0-2}$ with the value obtained for the double bonds from the IR spectrum, the composition of the olygomer mixture (modified Bis-$GMA)_{0-2}$: 82.1% (modified Bis-$GMA)_0$ and 17.9% (modified Bis-$GMA)_1$ was established. The compositions of the Bis-GMA_{0-2} /(modified Bis-$GMA)_{0-2}$/ TEGDMA monomer mixtures and the properties of the corresponding composites are presented in the table 1.

Table 1

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Monomers ratios Bis-GMA_{0-2}/ (modified Bis-$GMA)_{0-2}$ /TEGDMA	10/ 40/ 50	20/ 30/ 50	30 20/ 50	40/ 10/ 50	45/ 5/ 50
Water sorption, µg/mm^3	22,05	27,63	29,90	32,44	35,84

DISCUSSION & CONCLUSIONS: The water sorption decreases with the increasing of the (modified Bis-$GMA)_{0-2}$ in the mixture because of the hydrophobic character of the (modified Bis-$GMA)_{0-2}$ olygomers and of the high crosslinking density of the resulted polymer network.

REFERENCES: [1]C.Prejmerean, M. Moldovan, M. Brie, G. Furtos, D. Prodan, *(2001)*, Revue de Chemie, **52(9)**: 500-506