

EFFECT OF FILLER WEIGHT FRACTION AND SILANATION ON MECHANICAL PROPERTIES OF COMPOSITES BASED Silylated POLY--[BIS-MA].

Filiberto Rivera-Torres¹, Ricardo Vera-Graziano¹, Ma. Cristina Piña Barba¹, Margarita Navarrete-Montesinos², and Miguel Angel Juárez-Sánchez¹.

¹ Instituto de Investigaciones en Materiales, UNAM, AP 70-360, Coyoacán 14510, D.F., México.

² Instituto de Ingeniería, UNAM, AP 70-472, Coyoacán 04510, D.F. México.

To day the importance of composites on dental applications is due to high mechanical properties and chemical stability. This study examines the influence of filler loading and silane coupling agent on the hardness and modulus of Young of a composite for dental use, the glass transition temperature (T_g) of composite has a variation on function of filler weight fraction. The modulus of Young and vickers hardness are correlationship to T_g. The modulus of Young is obtained for photoacoustic technique (PA),¹ and hardness surface with a micro-hardness tester, the test was made in five regions of surface sample, T_g is obtained in samples of each composition with a DSC thecnique. The morphology, particle size of Bioglass 45S5 ® and the surface characteristic of a composite materials were analyzed, these study was made using atomic force microscopy AFM.

Two organic matrix were made, one with a hydrophilic copolymer Bis-GMA/TEGDMA and other with a relatively hydrophobic copolymer Si-[Bis-GMA]/TEGDMA.² The particles of Bioglass 45S5 ® used as a filler present a hybrid composition on function to the diameter (100 nm < diameter < 15µm), the filler was processed with a silane coupling agent, γ-methacryloxypropyltrimethoxysilane (γ-MPT).^{3,4} many samples were made with different Bioglass 45S5/Matrix rations (0, 10, 20, 25, 30, 35, and 40 % w/w). Samples were organized in two groups; first contemplate particles of filler non-silanized and the second group included particles with silane agent coupling. Samples had dimensions 10x10x5 mm and were obtained with a photo-polymerization processes, the system was activated with a blue monochromatic light, 468-480 nm (by using a dental lamp with the aid of an optical fiber), during 30 seconds in nine regions of surface. Five film of 1 mm thickness for each composite material were superposed in order to avoid the presence of air bubble on the mass.

In both cases, Bis-GMA/TEGDMA and Si-(Bis-GMA)/TEGDMA the vickers hardness and modulus of Young obtained show an increase when the filler concentration increases too but, Bis-GMA/TEGDMA values were higher than the values obtained for the other copolymer. T_g shows a proportional variation with the filler content and in general these properties improve if the filler was silanized.