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College of Dentistry

Study the effect of addition of silanized zirconium oxide nanoparticles on some properties of high-impact heat-cured acrylic resin

A thesis

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Abstract

Statement of problem: high-impact denture base resins, these polymers are stronger and tougher because this type of acrylic resin is able to absorbing greater amounts of energy at a higher strain rate before fracture. The incorporation of rubber has not been entirely successful because it can have detrimental effects on the transverse Strength and hence the rigidity of the denture base.

Purpose: The purpose of this study was to evaluate the effect of addition of silanized nano-zirconium oxide (ZrO_2) on some properties of high impact heat cure acrylic resin material .

Materials and methods:

.(100) samples were prepared and divided into five groups according to the test performed , Each group consisted of 20 specimens and these were subdivided into 2 groups Group (A): control group (10 specimens of high impact acrylic resin without Nano zirconium oxide) and Group (B):Study group(10 specimens of high impact acrylic resin with 3% wt nano zirconium oxide) and it was mixed by probe ultra-sonication machine for 3minutes . The tests conducted were impact strength, transverse strength, surface indentation hardness (shore D), surface roughness, water sorption and solubility. The results were statistically analyzed using Dunntt t-test.

Results

A highly significant increase in impact strength (**12.623**) Kj/mm^2 and transverse strength(**183.640**) N/mm^2 was observed with the addition of silanized (ZrO_2) Nano particles to high impact heat cure acrylic denture base material at the percentage of 3% wt ZrO_2 Nano particles. A significant increase in surface hardness(**85.320**) at 3% wt silanized ZrO_2 Nano particles. The water sorption and solubility were significantly decreased with the addition of silanized (ZrO_2) Nano particles

compared with the control group. And finally, no significant statistical difference in surface roughness with the addition of silanized (ZrO_2) Nano particles compared with the control group were found observed.

Conclusion:

The addition of silanized ZrO_2 Nano particles to high impact heat cure acrylic resin material improves the impact strength, transverse strength and surface hardness of high-impact heat-cure acrylic resin at the same time this addition decreases water sorption and solubility. On the other hand there was non-significant statistical difference in surface roughness with the addition of 3% wt of silanized ZrO_2 Nano particles were noticed.