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Evaluation the effect of addition of plasma treated polypropylene fibers and silanized silicon dioxide nanoparticles on some properties of heat-polymerized polymethylmethacrylate

A Thesis
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Abstract

Statement of problem:

Polymethylmethacrylate (PMMA) is the most commonly used material in denture construction. The material is far from ideal in fulfilling the mechanical requirements, like low impact and transverse strength and poor thermal conductivity are present in this material.

Aim of the Study:

The purpose of this study was to study the effect of addition a composite which include 1%wt silanized silicone dioxide nano fillers (SiO_2) and 1wt% oxygen plasma treated polypropylene fiber (PP) on some properties of heat cured acrylic resin denture base material (PMMA).

Materials and methods:

One hundred (100) prepared specimens were divided into five groups according to the tests, each group consisted of 20 specimens and these were subdivided into two groups (unreinforced heat cured acrylic resin as control group) and reinforced acrylic resin with (1%wt Nano SiO_2 and 1% wt oxygen plasma treated polypropylene fibers) group.The transverse strength¸impact strength, indentation hardness (shoreD),surface roughness and water sorption and solubility were investigated. The results were statistically analyzed using descriptive and t-test.

Results:

The results of this study show that a highly significant increase in mean value of impact strength(10.4939 Kj/m2), surface hardness (89.9375) surface roughness (.9498) and water sorption (.0171mg/cm^2) was observed with the addition of 1%wt silanized (SiO_2) nanoparticles and 1%wt oxygen plasma treated polypropylene fibers to (PMMA) , also significant decrease in transverse strength mean value (103.4753 N/mm^2), nonsignificant decrease occurred in water solubility (.0005mg/cm^2).

Conclusion:

The incorporation of 1%wt silanized SiO_2 nanoparticles and 1%wt oxygen plasma treated polypropylene fiber a composite to heat cure PMMA improves the impact strength, surface hardness and surface roughness of acrylic resin, at the same time this addition increase the water sorption and decrease water solubility; while significant decrease in transverse strength.