

**Studying the effect of addition a composite of
silanized Nano- Al_2O_3 and plasma treated
polypropylene fibers on some physical and
mechanical properties of heat cured PMMA
denture base material**

A Thesis

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Abstract

Statement of problem:

Polymethyl methacrylate (PMMA) is the most commonly used material in denture fabrication. 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 silanized Aluminum oxide Nano fillers (Al_2O_3) in percentages 0.5%wt ,1% wt , and 2.5wt% plasma treated polypropylene fiber (PP) on some properties of heat cured acrylic resin denture base material (PMMA).

Materials and methods:

One hundred fifty (150) prepared specimens were divided into five groups according to the tests, each group consisted of 30 specimens and these were subdivided into three groups (unreinforced heat cured acrylic resin as control group), reinforced acrylic resin with (0.5%wt Nano Al_2O_3 and 2.5% wt plasma treated polypropylene fibers) group and reinforced acrylic with (1%wt nano Al_2O_3 and 2.5%wt plasma treated polypropylene fibers group).The impact strength , transverse strength, indentation hardness (shore D) ,surface roughness and thermal conductivity were investigated , The results were statistically analyzed using ANOVA test .

Results:

The results of this study show that a highly significant increase in impact strength (16.8710 KJ/m^2) , surface hardness (86.1100), thermal conductivity (0.1454 w/mk) was observed with the addition of 0.5%wt (Al_2O_3) nanoparticles and 2.5%wt PP fiber to (PMMA) , also there is a significant increase in surface roughness($1.4986 \mu\text{m}$) and non significant increase occurred in transverse strength at the same percentage the value was (90.110 N/mm^2).

At the concentration of 1%wt nano(Al_2O_3) and 2.5%wt PP fiber also there is a highly significant increase in impact strength (17.9480 KJ/m^2) surface hardness (87.3350) and thermal conductivity (0.2244 w/mk) . Non significant differences in transverse strength were observed for all percentages. and significant increase in surface roughness ($1.5096 \mu\text{m}$).

Conclusion:

The addition of a composite of Al_2O_3 silanized nanoparticles and plasma treated poly propylene fiber to acrylic resin improves the impact strength, surface hardness and thermal properties of acrylic resin, at the same time this addition increase the surface roughness ; while non- significant increase in transverse strength .