

**The effect of Silicon di oxide Nano Fillers
reinforcement on some properties of heat cure
polymethyl methacrylate 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, and it adequately satisfies the esthetic demands. Color stability and ease of manipulation and polishing make it a desirable material. Despite its popularity, the material is far from ideal in fulfilling the mechanical requirements. In function, midline fracture is a common problem mainly due to flexural fatigue; it has been shown to be lacking an important properties that were impact strength and water sorption, which play an important role in patient satisfaction for both complete and partial dentures (*Berrong et al 2000*).

Aim of the Study:

The purpose of this study was to evaluate the effect of addition of surface treated silicon di oxide Nano filler (SiO_2) on some properties of heat cured acrylic resin denture base material (PMMA).The properties were Impact strength, Transvers strength, Surface hardness, Surface roughness, Water sorption and Water solubility.

Materials and methods:

In addition to controlled group SiO_2 powder was added to PMMA powder by weight in three different percentages 3%, 5% and 7%, mixed by probe ultra-sonication machine.

200 specimens were constructed and divided into 5 groups according to the test (each group consist of 40 specimens) and each group was subdivided into 4 sub-groups according to the percentage of added SiO_2 (finally each subgroup consist of 10 specimens) .

The tests conducted were impact strength (charpy tester) ,transverse strength, indentation hardness(shore D) , surface roughness ,water sorption and solubility

.For each test four sub groups (one controlled and three with added Nano SiO₂).

The results were statistically analyzed using ANOVA and LSD tests.

Results:

A highly significant increase in impact strength and transverse strength was observed with the addition of SiO₂ powder to (PMMA) at the percentage of 3% and 5%; while a significant reduction occurred in both impact and transverse strength specimen's tests at the percentage of 7%.

A Highly significant increase in surface hardness and roughness were observed at the percentage of 3%, 5%and7%. Also water sorption and solubility decreased significantly with the increase of percentage of SiO₂ Nano-filler addition.

Conclusion:

The addition of Nano SiO₂ powder to acrylic resin improves the impact strength and transverse strength of acrylic resin at the same time this addition decreases water sorption and solubility. On the other hand there was an increase in surface hardness and surface roughness with the increase in the concentration of Nano SiO₂ particles.A