

**Republic of Iraq  
Ministry of Higher Education  
And Scientific Research  
University of Baghdad  
College of Dentistry**



**The effect of the addition of Silanized  
Nano Titania Fillers on some Physical and  
Mechanical Properties of Heat Cured  
Acrylic 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, presented by high incidence of midline fracture, low impact strength and dimensional instability.

### Aim of the Study:

The purpose of this study was to evaluate the effect of addition of 3% wt of surface treated (silanized) Titanium oxide Nano fillers on the impact strength, transverse strength, hardness, roughness, water sorption and solubility of heat cured acrylic resin denture base material (PMMA).

### Materials and methods:

100 specimens were constructed, 50 specimens, prepared from heat cure PMMA without additives (control) and 50 specimens prepared from heat cure PMMA with the addition of TiO<sub>2</sub> Nano fillers. Each group was divided into 5 sub groups according to the test performed & it was mixed by probe ultrasonication machine. The tests conducted were impact strength, transverse strength, 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 ( 8.76 ) Kj/mm<sup>2</sup> and transverse strength(117.92) N/mm<sup>2</sup> was observed with the addition of (TiO<sub>2</sub>) Nano particles to (PMMA) at the percentage of 3% wt Nano TiO<sub>2</sub>. A significant increase in surface hardness (85.14) and in surface roughness (0.38) um at 3%

wt silanized Nano TiO<sub>2</sub>. The water sorption and solubility were significantly decreased with the addition of silanized (TiO<sub>2</sub>) Nano particles compared with the control group.

**Conclusion:**

The addition of TiO<sub>2</sub> Nano particles to heat cure acrylic resin improves the impact strength, transverse strength and surface hardness of heat cure acrylic resin at the same time this addition decreases water sorption and solubility. On the other hand there was an increase in surface roughness with the addition of 3% wt of silanized TiO<sub>2</sub> Nano particles.