

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



# **The Effect of Adding Titanium Silicate Nano Fillers on Some Properties of Maxillofacial Silicone Material**

A Thesis

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Science in Prosthetic Dentistry

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## Abstract

**Background:** Silicone elastomers are the main materials used nowadays in fabricating facial prosthesis, due to their high compatibility, chemical inertness, elasticity and ability to be colored by pigments. But many other properties need to be improved in order to have a better clinical performance like increasing tear strength, tensile strength and bonding to acrylic resin. So an increasing number of studies are performed each year trying to improve these properties, some studies concentrated on incorporating different types of nano oxide particles into the silicone matrix.

**Aim of the study:** The aim of this study was to investigate the effect of adding different concentrations of titanium silicate nano particles into silicone matrix on tear strength, tensile strength, hardness, wettability and shear bond with acrylic resin.

**Materials and method:** Depending on the results of a pilot study, 0.5% and 1% weight concentrations of titanium silicate nano filler were selected, as they had the most improvement in the properties of the silicone material. The manufacturer's instructions were followed in mixing and curing of the maxillofacial silicone material, and 150 specimens were prepared, the samples were divided into 5 groups according to the tests (tear strength, tensile strength, hardness, wettability and shear bond with acrylic resin), each group contains 30 samples, the groups were subdivided into three subgroups (A, B and C); group A is the control group with 0% of nano filler, while both B and C groups being experimental groups with 0.5% and 1% of nano filler respectively. The collected results of the study were analyzed statistically by using analysis of variance (one way ANOVA) and Post hoc tests. One control sample and one experimental sample were tested using

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scanning electron microscope (SEM) and fourier transform infrared spectroscopy analysis (FTIR) .

**Results:** For tear strength, tensile strength and shear bond with acrylic both experimental groups (0.5% and 1%) showed a highly significant increase in values compared to control groups, with the highest mean value being noticed in 0.5% group. While in shore A hardness test both experimental groups showed a highly significant increase in hardness compared to control group, with the highest mean value being noticed in 1% group. In a similar way, both experimental groups showed a highly significant increase in contact angle (decrease in wettability), the 1% group had the highest mean value.

**Conclusion:** The addition of 0.5% and 1% concentrations of titanium silicate nano particles into silicone elastomer enhanced some of the material properties with a slight decrease in wettability and increase in hardness.