

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



***Influence of Artificial Weathering on Some
Mechanical Properties of SiO₂ Nano Silicone Dioxide
Reinforced Maxillofacial Silicone***

A Thesis

*Submitted to the Council of the College of Dentistry, at
the University of Baghdad in Partial Fulfillment of the
Requirements for the Degree of Master of Science in
Prosthodontics*

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B.D.S., M.Sc.

2017 A.D.

1438 A.H.

Abstract

Background: Silicone elastomer material is widely used in fabrication of maxillofacial prosthesis because of its chemical inertness, biocompatibility and easy to manipulation and coloration, but with some shortage in mechanical and physical properties like (tensile and tear strength) associated with loss of elasticity and degradation after 4-14 months of service used. Therefore, many attempts were introduced to overcome these problems through the development of a new class of elastomer material, by reinforcement with nano-filler into polymeric matrix.

Aim of the study: The purpose of this study was to evaluate the effect of artificial accelerated weathering of SiO₂ nanofiller reinforced A 2186 maxillofacial elastomer on the tensile strength, tear strength, hardness, and surface roughness after (200, and 300 hours).

Materials and methods: According to the pilot study, a 5% weight concentration was selected because of improvement in tested mechanical properties. For main study one hundred and twenty samples were fabricated and divided into (4) groups according to each conducted test (tensile strength, tear strength, hardness, and surface roughness) with (30) samples for each test, furthermore each group subdivided into (3) subgroup (A, B, and C) according to aging condition (before aging, after 200 hours of aging, and after 300 hours of aging) with (10) samples for each subgroup. After that the samples are tested before and after artificial weathering. The results of study are collected and statistically analyzed using one-way ANOVA and post-hoc LSD test .The samples were analyzed by FTIR and examined by Scanning Electron Microscope (SEM).

Result: The result of SEM show good dispersion of nanofiller through the polymeric matrix before and after artificial weathering without re-agglomeration of nanoparticles within polymeric matrix as function of aging. After weathering for (200-300 hours) the tear strength, tensile strength values was significantly decreased, while the hardness value significantly increased with aging but still within acceptable clinical limit, and the surface roughness value was decreased non-significantly with aging.

Conclusion: Incorporation of SiO₂ nanofiller did not protect the silicone matrix from aging degradation, but can increase the service life of the prosthesis.