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**Effect of disinfection on some properties of heat-  
vulcanized maxillofacial silicone elastomer reinforced  
by nano silicon dioxide**

A thesis

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By

**Madiha Fouad Alazzawi**

B.D.S.

Supervised by

Assist. Prof.

**Dr. Mohammed Moudhaffar Mohammed Ali**

B.D.S, M.Sc

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# Abstract

**Background:** Since their first introduction in the prosthodontic field, silicone elastomers have been considered the material of choice in the construction of maxillofacial prostheses due to their chemical inertness, strength, ease of manipulation and durability compared to the other materials used before. Nevertheless, degradation and discoloration may result from environmental exposure and daily cleaning routine by the patient, which necessitate replacement of the prosthesis. Disinfection is essential for the maintenance of the prosthesis itself and the surrounding tissues as well. Nevertheless, it may produce some alteration in the physical, mechanical and color properties of the silicone. Therefore, the disinfection procedure must be carefully selected in order to prolong the service-life of the facial prosthesis.

**Purpose:** The aim of the present study was to examine the influence of three different disinfection procedures (Microwave exposure, soap, and 4% chlorhexidine gluconate) on the tear strength, surface hardness, surface roughness and color of SiO<sub>2</sub> reinforced Cosmesil M511 HTV maxillofacial silicone elastomers.

**Materials and Methods:** One hundred and sixty (160) specimens were prepared by mixing 5% SiO<sub>2</sub> nano particles and 0.5% intrinsic cream color into the silicone polymer according to manufacturer's instructions. Specimens were divided into 4 groups according to the performed test (tear strength, surface hardness, surface roughness and color) with 40 specimens each. Each group was further subdivided according to the disinfection procedure conducted (control, microwave exposure, soap and 4% chlorhexidine gluconate). Measurements of tear strength were done using universal testing machine (Instron). Surface hardness test was carried out with a Shore A Durometer. Surface roughness was analyzed with a portable digital Profilometer. Color absorbance was established with a Spectrophotometer. After the initial testing, all specimens were submitted to disinfection procedure 3 times a week for 60 days.

Measurements were repeated and data were statistically analyzed using one-way ANOVA followed by Fisher's LSD or Games-Howell test. One sample was examined under Scanning Electron Microscope (SEM) to evaluate the homogeneity of nano filler dispersion into the polymeric matrix.

**Results:** Spectrophotometer results showed non-significant decrease in the light absorbance of all experimental groups after disinfection, indicating a strong integration between the nano filler and the polymeric chains, which was not broken during the disinfection procedure. Highly-significant increase in Shore A hardness was noticed while surface roughness decreased high significantly in all experimental groups. Tear strength reduced significantly after disinfection in all experimental groups. SEM showed homogenous dispersion of the SiO<sub>2</sub> nano filler within the polymeric matrix.

**Conclusion:** Disinfection seemed to cause different amount of alteration in all of the tested properties of silicone. High color stability is expected in this type of maxillofacial silicone after disinfection. Although microwave exposure had increased the hardness of the material, it is considered a satisfactory disinfection procedure for the maxillofacial silicone prostheses since it caused the least effect on the tear strength and surface roughness of the material; in addition to that, the surface hardness values are considered within the clinical acceptance. Therefore, microwave exposure is recommended for the disinfection of maxillofacial silicone prostheses.