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

INVESTIGATING SOME PHYSICO-MECHANICAL PROPERTIES OF MAXILLOFACIAL SILICONE AFTER ADDITION OF STRONTIUM TITANATE NANOPOWDER

A Thesis Submitted to the Council of the College of Dentistry/ University of Baghdad in Partial Fulfillment of the Requirements for the Degree of Master of Science in Prosthodontics

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ABSTRACT

Background: Prosthetic devices have been commonly used to restore defects of congenital or acquired origin as cancer or trauma. Although both patients and prosthodontists accept silicones, additional improvements are needed to increase their performance. Researches had been conducted to produce a new generation of polymer with nanofiller integrated into the polymer, resulting in better material that combines strength of nanofiller with the flexibility of the polymer. The study aim to evaluate the effects of strontium titanate nanopowder ($SrTiO_3$ NP) addition on some properties of VST-50 maxillofacial silicone.

Materials and Methods: Two weight percentages (1 wt% and 1.5 wt%) were used as determined by the pilot study, which yielded most suitable results. A total of 180 specimens were prepared and divided into control (without nanofiller) and two experimental groups (1 wt% and 1.5 wt% $SrTiO_3$ NP). Each group was subdivided into seven identical subgroups. For each subgroup, ten specimens were utilized for each test (Tensile strength, elongation percentage, tear strength, shore A hardness, surface roughness, UV absorption, water absorption and solubility). Significance level was set at p=0.05 when statistical analysis was performed.

Results: Both experimental groups revealed highly significant increase in tensile strength, tear strength and surface roughness ($P < 0.01$). The 1.5 wt% group revealed a highly significant increase in hardness ($P < 0.01$), while 1 wt% group revealed a significant increase ($P < 0.05$). Both experimental groups showed highly significant decrease in elongation percentage ($P < 0.01$). There was highly significant increase in water

absorption and solubility of experimental groups as well as in UV light absorption when compared to control group ($P < 0.01$).

Conclusion: Addition of $SrTiO_3$ nanopowder to VST-50 silicone enhanced tear strength and tensile strength particularly at (1 wt%). Hardness and surface roughness were increased, but only to clinically acceptable levels. Percentage of elongation was decreased significantly. Water absorption, solubility, and UV absorption levels all increased.

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