

**Ministry of Higher Education
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Baghdad University
College of Dentistry**



Effect of Multi-Wall Carbon Nano Tubes on The Microhardness and Thermal Conductivity of Dental Enamel

A Thesis

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By

**Mohammed Kadhim Jawad
B.D.S. (2008)**

Supervised By

**Assistant Professor. Dr. Abbas Fadhil Ali
B.D.S., Ph.D.**

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Abstract

The objectives of this study was to evaluate the effect of addition of Multi-Wall Carbon Nano Tubes(MWCNTs) of different concentration (0.05 mg/mL^{-1} , 0.25 mg/mL^{-1} , 0.5 mg/mL^{-1} and 1 mg/mL^{-1}) with on either (dimethyl sulphoxide DMSO and distilled water DW) on tooth enamel. It is intended to evaluate enamel microhardness in ($\text{Kg} \cdot \text{m}^{-2}$) and enamel thermal conductivity before and after the application of (MWCNTs).

Ninety mandubular first premolar were prepared for this study. They were divided into two groups. The first group contains 54 sample to measure the microhardness of the enamel. To overcome the teeth curvature in microhardness measurement, the position of indenter were optimized to coincide linear buccal surface. The second group contains 36 sample to measure the thermal conductivity of the enamel were prepared by cutting enamel part in triangle form with a base of 7.5 mm , height of 9.5 mm and thickness of 2 mm according to the requirements of the Fourier's law by abrasive disk .

The results enamel microhardness showed that a significant increase in the enamel microhardness and enamel thermal conductivity for groups 0.05 mg/mL (group B) , 0.25 mg/mL (group C) , 0.5 mg/mL (group D) and 1 mg/mL (group E) compared with control group (group A) in DW media and DMSO media. The results showed a significant increase in the enamel microhardness and enamel thermal conductivity for polished samples compared with unpolished samples in DW media and DMSO media. DMSO media increases the enamel microhardness and enamel thermal conductivity more effectively than DW media. Scanning electron microscope showed a significant deposition of MWCNTs in the depth of the enamel exceeding the surface layer. The polished specimens had more deposited MWCNTs compared with non-polished specimens. However, the nano dimensions with conjunction with pre-chemical treatment enabled the MWCNTs to penetrate and settle down inside the enamel. The final conclusion highest mean value obtained was 1 mg/mL (group E) in the enamel microhardness and enamel thermal conductivity suspension in DW media and DMSO media.