

**The effect of incorporation of prepared Ag-Zn
Zeolite on some properties of heat polymerized
acrylic denture base materials**

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 prosthetic
dentistry

By

Zainab AbdulMonim Azeez

B.D.S

Supervised by

Prof. Dr. Nabeel Abdul Fatah

B.D.S., MSc. Prosthodontics(U.K.)

Dean of the College of Dentistry

University of Baghdad

2014 A.D

1435A.H

Abstract

Poly(methylmethacrylate) is the most widely used material in denture fabrication. The characteristics of acrylic resin which support microorganism development can threaten the oral health of denture users. Many attempts were carried out to avoid this problem by incorporation of various inorganic material which contained antimicrobial cation into denture base material. This study was assigned to prepare and incorporate Ag-Zn zeolite into heat cured denture base material as Antimicrobial material and to investigate its effect on some properties of heat cured acrylic denture base materials.

Sliver –zinc zeolite was prepared by ion exchange method of zeolite type 13X in aqueous solution of sliver and zinc ion and characterized by atomic absorption spectroscopy, X-Ray powder Diffraction, Fourier Transform Infrared Spectrophotometer and laser Diffraction particle size analyzer. Then it was incorporated into poly(methylmethacrylate) powder in 0.5% by weight, then the heat cure acrylic resin was prepared in the usual manner and according to the manufacturer's instruction.

The tests conducted in this study were: impact strength test , transverse strength test , surface hardness test ,surface roughness test, water sorption test, water solubility test and color change measurement after addition.

In each test two subgroup with 10 specimens, one for the pure poly(methylmethacrylate) as a control and the other for poly(methylmethacrylate) with 0.5% of Ag-Zn zeolite. The results were statistically analyzed by t-test at p value 0.05.

Results of the infrared spectra confirmed both the incorporation of sliver and zinc ion into zeolite and the interaction between poly(methylmethacrylate)

and Ag-Zn zeolite. Further confirmation about silver and zinc ion incorporation into zeolite was obtained from the result of atomic absorption spectroscopy.

Moreover, the results of X-ray powder diffraction indicated the ion exchange method didn't cause change in zeolite framework. A non significant effect resulted from the addition of 0.5% silver-zinc zeolite on the impact strength and control group and the experimental group showed mean values of 8.68 and 8.43 KJ/M², respectively, in addition to transverse strength, surface hardness, surface roughness and cause no change in color of heat cure denture base material this explained by the small percentage of zeolite used in the study and small particle size. Regarding water sorption and solubility test, the current study revealed that there was a highly significant decrease in water sorption with higher mean value was for the control group (0.3mg/mm²) while for the experimental group was (0.28mg/mm²) and a significant increase of water solubility and the mean value of the experimental group was higher than that of the control group which equal to (0.06, 0.03 mg/cm²) respectively, after the addition of 0.5% silver-zinc zeolite.

In a conclusion, preparation of silver-zinc zeolite could be performed successfully and the addition of 0.5% of antimicrobial silver-zinc zeolite into heat cure acrylic had a non significant effect on the impact strength, transverse strength, surface hardness, surface roughness and did not change the color, also there was a significant decrease in water sorption and increase in water solubility of acrylic resin.