

Evaluation of thermal conductivity of alumina reinforced heat cure acrylic resin and some other properties

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

Statement of problem :

The polymethylmethacrylate is the most reliable material for the construction of complete and partial dentures but it has been shown to be lacking an important property that was its thermal conductivity, where thermal conductivity plays an important role in patient satisfaction with complete and partial dentures.

Aims of the Study :

The purpose of this study was to improve the thermal conductivity of acrylic resin by adding alumina powder and investigate the effect of this additive filler (Al_2O_3 powder) on some properties of heat cure PMMA denture base material .

Materials and methods :

Al_2O_3 powder was added to PMMA powder by weight in three different percentages 5% , 7.5% and 10% .

240 specimens were constructed and divided into 6 groups according to the test (each group consist of 40 specimens) and each group was subdivided into 4 sub groups according to the percentage of added alumina (each subgroup consist of 10 specimens) .

The test conducted were thermal conductivity by the use of Lee's disc and human skin , water sorption and solubility , surface roughness , surface hardness (Shore D) , impact strength (un notched) and tensile strength .

Results

A highly significant increase in thermal conductivity occurred with the addition of Al_2O_3 powder while a significant reduction occurred in both impact and tensile strength specimens tests .

Highly significant increase in surface hardness was observed . Also water sorption and solubility decreased significantly .

Surface roughness was not affected except a significant increase was observed in surface roughness by the addition of 10% Al_2O_3 to PMMA .

Conclusion

The addition of Al_2O_3 powder to acrylic resin improve the thermal conductivity of acrylic resin at the same time this addition decreases both impact strength and tensile strength values . On the other hand there was an increase in surface hardness, water sorption and solubility were decreased while surface roughness not affected with small percentages of alumina .