



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



# **THE EFFECTS OF HYDROGEN PEROXIDE GAS PLASMA AND SOLUTION ON SOME PROPERTIES OF POLY-ETHER-ETHER-KETONE**

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 Science in  
Prosthodontics

Submitted By  
**Mustafa Asaad Mohammed**

B.D.S

Supervised by Assistant  
Professor  
**Dr. Wasmaa S. Mahmood**  
B.D.S., M.Sc. Prosthodontics

## Abstract

**Statement of problem.** The daily and repeated immersion of dentures in disinfectant solutions can cause changes in the properties of Polyetheretherketone (PEEK) and polymethylmethacrylate (PMMA), but there is lack of studies evaluating these effects.

**Purpose.** The purpose of this *in vitro* study was to investigate the effect of hydrogen peroxide solution immersion and hydrogen peroxide plasma sterilization on the mechanical and physical properties (transverse strength, impact strength, surface hardness, surface roughness, water sorption and solubility) of CAD/CAM based PEEK and PMMA.

**Material and methods.** A total number of 400 specimens were prepared in this study, they were divided into two main groups according to the type of the material being used (PEEK and PMMA). Each main group was subdivided into five subdivisions according to the type of the test used (transverse strength, impact strength, surface hardness, surface roughness, water sorption & solubility). For each test 40 specimens were further subdivided into four groups the **1<sup>st</sup> group** is the control. (10 specimens), **2<sup>nd</sup>** to be treated by hydrogen peroxide gas plasma. (10 specimens), **3<sup>rd</sup>** group is to be immersed in 3% hydrogen peroxide solution for 10 minutes. (10 specimens), **4<sup>th</sup>** group is to be immersed in 3% hydrogen peroxide solution for 30 minutes. (10 specimens).

Statistical analysis was performed using Two-way ANOVA and the data was considered statistically significant at a level of  $\leq 0.05$ .

**Results.** FTIR spectral result of PEEK and PMMA after plasma sterilization and at 30, 10 minutes immersion time in 3% hydrogen peroxide showed that chemically there is no interaction between the materials and hydrogen peroxide also results show no signs of degradation, losing of functional groups or separation of active peaks, Statistical analysis using two-way ANOVA showed a non-significant changes in the

mean value of the tests carried out for the two immersion times and hydrogen peroxide plasma sterilization for both materials.

**Conclusions.** CAD/CAM based polymethylmethacrylate (PMMA) and Polyetheretherketone (PEEK) Immersion in 3% hydrogen peroxide solution and plasma sterilization showed no significant effect and changes in the mechanical and physical properties of the materials.



جمهورية العراق  
وزارة التعليم العالي والبحث العلمي  
جامعة بغداد  
كلية طب الأسنان



## تأثيرات محلول و بلازما غاز بيروكسيد الهيدروجين على بعض الخصائص لبولي إيثر-إيثر-كيتون

رسالة مقدمة الى مجلس كلية طب الاسنان / جامعة بغداد  
كجزء من متطلبات نيل شهادة الماجستير  
في صناعة الاسنان

من قبل  
مصطفى اسعد محمد  
بكالوريوس طب وجراحة الفم الاسنان

بأشراف  
الأستاذ المساعد الدكتور وسماء صادق محمود  
ماجستير في صناعة الاسنان