

Sudan University of Science and Technology

**College of graduate studies and scientific
researches**

Utilization of Diode Lasers (675nm and 820nm)
in Enhancing Hardness of Chemical Cure
Composite for Dental Filling

إستخدام ليزرات الثنائي (675 نانومتر و 820 نانومتر) في
تحسين الصلادة للحشوات البيضاء ذات المعالجة
الكيميائية

A thesis submitted as a partial fulfillment of the
requirements for the degree of master in laser applications
in physics

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بسم الله الرحمن الرحيم

**قالوا سبحانك لا علم لنا إلا ما علمتنا {
انك انت العليم الحكيم**

صدق الله العظيم

(الآية 32 سورة البقرة)

Dedication

**First ,to those closest to
me:my parents,
my brothers and my sisters
Second,to my colleagues
And to all of you.**

Acknowledgement

Thanks to the greatest god for inspiring me to introduce in front of you this work. The first person I would like to thank is Prof. Dr. Nafie A. Almuslet who is not only guided me as my supervisor but also encouraged, and challenged me throughout my research. His wide knowledge and his logical way of thinking have been of great value to me, and for his patience.

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ABSTRACT

The objective of this research was the utilization of diode lasers to enhance the hardness of chemical cure composite dental restorative material. Three samples were prepared, the first one was irradiated with 675 nm wavelength , 30 mW output power, the second one irradiated with 820 nm wavelength, 200 mW output power, the two samples were irradiated for 3, 4, 5, and 6 minutes. The third sample was left without irradiation as a control sample. The hardness of the three samples was measured at different time intervals .The increasing ratio of the hardness was determined for every used laser and exposure time .The results showed that irradiation of the filling material with diode laser was increase the rate of polymerization interaction which is increase the hardness of the filling material. The higher percentage of hardness increasing after irradiating the filling material with 675 nm diode laser was 23% while the higher percentage after irradiating the filling material with 820 nm diode laser was 22%, compared with the hardness's of unirradiated samples.

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المستخلص

الهدف من هذا البحث هو زيادة الصلادة لعينات من حشوات الاسنان البيضاء بواسطة تشعيها باستخدام ليزر اشباه الموصلات (ليزر الثنائي) تم تحضير ثلاث عينات حيث تم تشيع العينة الاولى بليزر ذو طول موجي 675 نانومتر وقدرة 30 ملي واط. أما العينة الثانية فقد شععت بالليزر ذي الطول الموجي 820 نانومتر وقدرة 200 ملي واط. تشيع العينتان كان لأزمان مختلفة قدرها: 3, 4, 5, 6 دقائق بينما تركت العينة الثالثة بدون تشيع كعينة مرجعية. تم قياس الصلادة باستخدام جهاز اختبار الصلادة للمواد وذلك بعد ساعتين من التشيع, ثم اربع ساعات, ثم ثمان ساعات ثم ستة عشر ساعة واربعة وعشرين ساعة. تم تحديد نسبة الزيادة في صلادة الحشوات لكل ليزر ولكل وزمن تعريض علي حدة بالمقارنة مع صلادة العينة غير المشعة. أوضحت النتائج أن تشيع مادة الحشوة البيضاء ذات المعالجة الكيميائية بواسطة ليزر الثنائي يزيد من معدل تفاعل البلمرة مما ادي الي زيادة في صلادة مادة الحشوة. كانت أعلى نسبة زيادة في صلادة مادة الحشوة عند التشيع بليزر الثنائي 675 نانومتر هي 23%, بينما كانت أعلى نسبة للزيادة في صلادة مادة الحشوة عند التشيع بليزر الثنائي 820 نانومتر هي 22%, وذلك مقارنة بصلادة العينات غير المشعة.

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