



**Sudan University of Science and  
Technology  
College of Graduate Studies**



# **Investigation of Irradiated Blood by Diode Laser (675nm) using FTIR and UV-Visible Spectroscopy**

**فحص الدم المشع بليزر الثنائي (675nm) باستخدام  
مطيافية الأشعة تحت الحمراء المزود بمحول فورييه و  
الأشعة فوق البنفسجية والمرئية**

**A dissertation Submitted as Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Physics.**

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**September 2016**

# الآية

قال تعالى:

﴿قَالَ يَا قَوْمِ أَرَأَيْتُمْ إِن كُنْتُمْ عَلَىٰ  
بَيِّنَةٍ مِّن رَّبِّي وَرَزَقَنِي مِنْهُ رِزْقًا حَسَنًا  
ۖ وَمَا أُرِيدُ أَنْ أَمْلِكُمْ إِلَىٰ مَا  
أَنْهَاكُمْ عَنْهُ ۖ إِن أُرِيدُ إِلَّا الْإِصْلَاحَ مَا  
اسْتَطَعْتُ ۖ وَمَا تَوْفِيقِي إِلَّا بِاللَّهِ ۖ  
عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ﴾

صدق الله العظيم

سورة هود، الآية (88)

# Dedication

I dedicate my dissertation work to my mother and my father for their patience and endless love.

I also dedicate this dissertation to my brothers, sisters and my another half for coloring my life, and without their encouragement, this work would not have seen the light.

My deepest thank goes to all my family and friends for helping me.

## **Acknowledgments**

First of all, I would like to thank Allah for giving me the strength to finish this study.

Special thanks Dr Ali Abdel Rahman Saeed Marouf, supervisor of my dissertation for his guidance and assistance throughout the progress of this thesis .I would like to express my gratitude to Dr. Mohammed Osman Awad Allah and my thanks extend to staff of Hematology laboratory in Sudan University of Science and Technology and staff of Institute of Laser-Sudan University of Science and Technology.

## Abstract

Interaction of lasers with biomaterials such as blood is an important area of research, in this research the samples of blood were obtained from two volunteers, and each sample was divided into five samples, each one contains 1 ml, for irradiation and control. Blood samples were irradiated by Omega xp laser (Wavelength  $\lambda=675$  nm, Power = 30mW), the irradiation times were 1, 2, 3 and 4 mint. Then all samples were characterized by FTIR and UV- vis spectroscopy.

UV-Visible spectra showed that there was a decrease in the intensities of the irradiated four samples in comparison with the control sample, and there was no relation with variation in the dose with the intensities of the irradiated samples.

FTIR spectra showed significant changes between the various bonds between C=O (Amide I), C-O (Anhydrides), N=O (Nitro), C-N (Amines) and C-H (Alkenes), the intensities of irradiated blood samples spectra decreases for all samples with increasing of laser exposure time. These results may be due of denaturation blood components.

## المستخلص

يعتبر تفاعل الليزر مع المواد الحيوية مثل الدم احد مجالات البحث المهمة, في هذا البحث تم اخذ عينات الدم من متبرعين اثنين, قسمت كل من العينتين الي خمسة اجزاء تحتوي كل منها على 1 مل بغرض التشيع وترك واحدة منها عينة مرجعية. شععت عينات الدم بليزر اوميكا اكس بي  $\lambda=675\text{ nm}$  وقدرة 30mW وكانت أزمنة التعريض لشعاع الليزر هي (1, 2, 3 و 4) دقائق. تم توصيف كل العينات باستخدام جهاز مطيافية الاشعة تحت الحمراء الزود بمحول فورييه FTIR و جهاز مطيافية الاشعة فوق البنفسجية والمرئية.

أظهرت أطياف UV-Vis أن هناك انخفاض بين سعة أطياف العينات الأربعة المشععة بالمقارنة مع العينة الضابطة , وليس هناك علاقة مع التغير في الجرعة مع شدة العينات المشععة.

أظهرت أطياف FTIR تغيرات معينة بالنسبة للروابط  $C = O$  (أميد I),  $C-O$  (المركبات الحمضية),  $N=O$  (نيترو),  $C-N$  (الأمينات) و  $C-H$  (الألكينات), حيث تناقصت سعات الامتصاص في الاطياف بزيادة زمن تعريض الليزر , هذه النتيجة ربما تكون نسبة لتفكك مكونات الدم.

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