

**Sudan University of Science & Technology
College of Postgraduate Studies**

***Thickness and Refractive
Index Measuring
Arrangement as a first
Stage for an
Optical Coherence
Tomography System***

A thesis submitted as a partial fulfillment of the
requirements for the degree of
M. Sc. in physics

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February 2004

Dedication

To

My Parent's Soul

My Sisters....

My Brothers....

My Friends ...

Acknowledgments

At first, I thank the Almighty Allah for making me able to complete this thesis.

I would like to express my sincere appreciation to my supervisor Prof.Kh. I. Hajim and to Dr. Hussain A. Jawad, Dr. K.A. Al -Naimee, Dr. Nafie Add Al- Lattief, Mrs. Sheelan and the Iraq Laser Optics group members for their encouragement and assistance through producing this thesis.

Thanks to College of post graduate studies and Institute of laser Sudan University of science & Technology, and Sudan institute for natural sciences.

Special thanks to Dr. Abbaker Ali, Kassim Elhity, Miss Waffa and Amna Hassan, and Sharaf E.Hassan for their continuous help to accomplish this work.

Also my thanks are extended to Dr. Abd El-Moniem Awad Eljeed, Gafar Adb Elhameed, Sohad Saad and Nemat Yousif.

الخلاصة

في هذا العمل تم بناء منظومة تداخل مايكلسون مع وحدة مسح باستخدام الهيليوم نيون ليزر كمرحلة أولى لبناء منظومة Optical Coherence Tomography (OCT) بهدف تحديد سمك ألواح زجاجية شفافة وقياس معامل الانكسار لها.

تتكون المنظومة من جزئين، الجزء الأول مدخال مايكلسون، أما الجزء الثاني في المنظومة فهو عبارة عن وحدة مسح للأهداب المتكونة من تداخل الضوء في مدخال مايكلسون، وهذه الوحدة تتكون من كاميرا رقمية وكاشف مع راسم ذبذبات.

ومن خلال حساب سمك بعض الألواح الزجاجية التي تتغير من حالة أهداب التداخل عند وضعها في أحد طرفي مدخال مايكلسون، تم حساب التغير الذي طرأ في الأهداب ومعامل انكسار الألواح الزجاجية، ومن خلال العلاقة المعروفة بين سمك اللوح والتغير الحاصل في الأهداب يمكن الوصول لقياس سمك أي جسم شفاف عند وضعه في مدخال مايكلسون من خلال تطبيق تلك العلاقة.

Abstract

This work deals with the first step of optical image technique called optical coherence tomography (OCT), an interferometric imaging technique that provides cross-sectional views of the subsurface microstructure of a sample. Following a discussion of the basic theory of OCT, an overview of the issues involved in the design of the main components of OCT system is presented.

Also, a Michelson interferometer with scanner unit (digital CCD camera and photodetector with oscilloscope) was used, and the shift in the circular fringes was used to measure the thickness and refractive index of transparent materials through the mathematical relation between the differences of the number of fringes before and after putting the transparent glass plate and thickness.

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