

# الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

إِنَّهُ طُفُّ السَّمَاءِ وَأَوْتَارِ الْأَرْضِ وَهُوَ فِي يَمِينِ سَعْدِ لَيْلَى كُلِّ شَيْءٍ قَدِيرٌ

صدق الله العظيم

( المائدة: 120 )

# **DeDication**

To my faTher soul ,

To my moTher ,

To my HUSBOND,

To my broThers,

To my distinguished col l eagues and,

To my friends

## **Acknowledgment**

I thank God a lot for the given blessing, and I would like to express my sincere gratitude to my supervisor Prof. Dr. NafieAlmuslet for his continuous support, patience, motivation, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. I would like to express my special appreciation and thanks to the staff of laser institute for their support. I would also like to thank Dr. Sad Aldien, Dr. YounisAbuAsha and all the staff of the department of mechanical engineering at Sudan University of Science and Technology for their help and technical support.

## Abstract

This work aimed to fabricate multilayers thin films by liquid deposition and to determine their optical properties. Three dyes were used for this aim; Phenexazon, Rohadamine and Coumarin.

Five samples were made from these dyes. The thickness of the thin film was deduced from the interference fringes made by He – Ne laser incident on the film during deposition.

Sample one was made of three layers, the first one was Phenexazon and the second was Rohadamine and the third was Coumarin. The thickness of each layer was equal to half the wavelength of He-Ne laser.

Sample two was made of three layers; the first one was Phenexazon, the second was Rohadamine, they have same thickness equal to half the wavelength of Helium-Neon laser, while the third layer was Coumarin with thickness equal to the wavelength of He-Ne laser.

Sample three was made of three layers, the first was phenexazon with thickness equal half the wavelength of He-Ne laser, the second was Rohdamine with thickness equal the wavelength of He-Ne laser, and the last layer was Coumarin, with thickness equal half the wavelength of He-Ne laser .

Sample four was made of three layers; the first was Phenexazon with thickness equal the wavelength of He-Ne laser and the second was Rohdamine, while the third one was Coumarin. The thickness of each layer was equal half the wavelength of He-Ne laser.

Sample five was made of three layers; the first one was Phenexazon, the second was Rohdamine, the third was Coumarin. The thickness of each layer was equal to the wavelength of He-Ne laser.

The optical properties of the fabricated thin films were deduced from the transmission spectrum recorded using different lasers with many wavelengths in the range between 500 – 950 nm.

The transmission spectrum for each thin film was recorded, and then the absorption coefficient, the refractive index, the transmission and the reflectivity for each fabricated thin film were determined and compared with the other thin films.

The results of the optical properties showed that some of the fabricated thin films can be used as reflectors or filters in certain spectral range. At the end of this some recommendations were presented as future work.

## المستخلص

الهدف من هذا العمل هو تحضير أغشية رقيقة من عدة طبقات باستخدام تقنية ترسيب السوائل حيث استخدمت ثلاث صبغات محلولة بواسطة الايثانول وهي (Coumarin–Rhodamine - Phenexazon ) بتركيز محدد لتحضير هذه الأغشية. تم ترسيب الصبغات و السيطرة على سماكة الاغشية الرقيقة وذلك من خلال أهداف التداخل التي يكونها ليزر الهليوم نيون عند سقوطه على الغشاء اثناء التحضير. بعد ذلك تم تسجيل انطباع النفاذية لكل غشاء ومن ثم تم حساب الانعكاسية ومعامل الامتصاص و معامل الإنكسار. تم تحضير خمسة أغشية رقيقة من الصبغات Coumarin– Rhodamine - Phenexazon بعدة طبقات, كالآتي :-

العينة الاولى من ثلاثة طبقات: الطبقة الاولى من (Phenexazon) والثانية من (Rohadamin) والاخيرة من (Coumarin) وكل طبقة كانت ذات سمك يساوي نصف الطول الموجي لليزر الهليوم نيون.

العينة الثانية مكونة من ثلاث طبقات: الطبقة الاولى من (Phenexazon) والثانية من (Rohadamin) والثالثة من (Coumarin) الطبقة الاولى والثانية كان سمك كل منهما يساوي نصف الطول الموجي لليزر الهليوم نيون والطبقة الاخيرة سمكها يساوي الطول الموجي لليزر الهليوم نيون .

العينة الثالثة مكونة من ثلاثة طبقات: الطبقة الاولى كانت من (Phenexazon) بسمك نصف الطول الموجي لليزر الهليوم نيون اما الطبقة الثانية فكانت من (Rhodamine) ذات سمك يساوي الطول الموجي لليزر الهليوم نيون اما الطبقة الاخيرة من (Coumarin) فقد كان سمكها يساوي نصف الطول الموجي لليزر الهليوم نيون .

العينة الرابعة مكونة من ثلاثة طبقات: الاولى من صبغة ال(Phenexazon) ذات سمك يساوي الطول الموجي لليزر الهليوم نيون. والثانية من (Rhodamine) والثالثة من (Coumarin) لكل منهما سمك يساوي نصف الطول الموجي لليزر الهليوم نيون.

العينة الخامسة من ثلاثة طبقات: الاولى من (Phenexazon), الثانية من (Rhodamine) اما الطبقة الاخيرة فقد كانت من (Coumarin) و سمك كل طبقة يساوي الطول الموجي لليزر الهليوم نيون.

تم استخدام عدة ليزرات باطوال موجية تتراوح بين 532-915 نانوميتر للحصول على اطياف النفاذية لهذه الاغشية وبالأستفادة من هذه الأطياف و من معرفة سماكات العينات الخمسة فقد تم حساب معامل الامتصاص ، و الإنعكاسية و معامل الإنكسار لكل عينة.

وقد اجريت مقارنة بين العينات الخمسة من حيث النفاذية ، الإنعكاسية ، معامل الأمتصاص و معامل الإنكسار .

من النتائج المتحصلة نستنتج أن بعض الأغشية المحضرة يمكن استخدامها كعواكس في حين أن أغشية أخرى يمكن استخدامها كمرشحات في مديات طيفية متعددة.

في نهاية هذا العمل قدمت توصيات متعددة كمقترحات لأعمال مستقبلية.

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