







شبكة المعلومـــات الجامعية التوثيق الالكتروني والميكروفيا.



جامعة عين شمس

التوثيق الالكتروني والميكروفيلم



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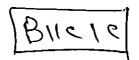




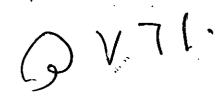








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Analysis of Polymer-based Optical Waveguide Couplers

By

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B.Sc., Electronics & Communications, Zagazic University, 1995

Thesis
submitted in partial fulfillment
of the requirements for the degree of master
in
Engineering physics

20031

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ACKNOWLEDGMENTS

I wish to express my deep gratitude to Assoc. Prof. Dr. Hamed Ibrahem Abdelkader (Faculty of Science, Physics Department) for his constant guidance and encouragement through the research.

It is a pleasure to hearty acknowledge my deepest gratitude to Assoc. Prof. Dr. Abed Mohamed Nasr (Faculty of Engineering, Physics Department) who did his best to facilitate this work and who spared no effort until this work come to existence.

I would like to express my deep thanks and gratitude to Prof. Dr. Mohamed Osman (Vice Dean, Higher Technological Institute, Ramadan Tenth City) for his valuable advices and continuous encouragement.

I would like also to thank Dr. Hussein El-Sayess (Head of Basic Science Department) for his help and general assistance.

Special thanks to my family: my mother, my father, Tarek, Hesham, Hany and finally my wife and my daughter Amira.

<u>abstract</u>

ABSTRACT

This work is split into two main areas of study. The first is preparing some thin films made of photoactive polymer (polycarbonate PC films doped with 7 % wt of DSR1). Also the thickness and the refractive index of these films are measured as well.

In the second area, we made a theoretical studies (depend on the data obtained from the first part) of optical switching based on a photoactive polymers. These theoretical studies split into two parts. The first is studying an optical switch consists of two slab waveguides one of them made of a photoactive polymer. We found that for synchronous slabs there are always two solutions of the compound mode problem. These two modes of the compound structure would have even and odd symmetry if both slabs were identical. However, even for non-identical synchronous slabs the two modes can be superimposed so that at the input end of the switch their fields nearly cancel in one slab while they reinforce each other in the opposite slab. Since both modes have slightly different propagation constants B_1 and B_2 , their relative phases will reverse at a distance:

$$L = \frac{\pi}{(B_2 - B_1)}$$

At this point the mode fields reinforce each other in the opposite sense, accounting for the exchange of light power between the two waveguides of the switch. When the two slabs are not synchronous no exchange of light energy is taking place.

The second part is studying an optical switch consisting of a fiber suspended at a constant distance parallel to the surface of a slab made of a photoactive polymer. We found that the fate of light, initially launched into the fiber, depends upon the relationship between the refractive index values of slab and fiber. When the refractive index of the slab is considerably lower than that of the fiber, no power is transferred out of the fiber (off state) when the refractive indices of fiber and slab are more nearly the same, a beating phenomenon is observed, that is, light is exchanged periodically between the fiber and the slab. When the refractive index of the slab is considerably higher than that of the fiber, most of the power is transferred to the slab (on state).

The switching in this study is based on using a photoactive polymer as a switching material. Hence, the optical switch under consideration in each case is designed theoretically to utilize light from an external source to trigger the required change in refractive index in the photoactive polymer of the thin film with a reasonable time.

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