شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومـــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

EL-MANSOURA UNIVERSITY
FACULTY OF ENGINEERING
PHYSICAL SCIENCE DEPARTMENT

Analysis of Polymer-based Optical Waveguide Couplers

By

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ABSTRACT

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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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