

PMMA/BDK/MR

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.PMMA/BDK/MR

BDK

PMMA

MR

V.A.S.E

PMMA MR :

Study of the Optical Properties PMMA/BDK/MR System Using the Spectroscopic Ellipsometry

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ABSTRACT

In this research the optical properties of PMMA/BDK/MR system have been studied. This system was prepared from the Azo-dye of methyl red (MR) in different degrees of acidity and doped with poly methyl methacrylate (PMMA). Benzyl dimethyl ketal (BDK) was used as photoinitiator at certain rates of size, and studying its optical characteristics by using the variable angle spectroscopic ellipsometry. The results show

that increasing of basic concentrations of the system the ground energy increases compered with the increasing of acidic concentrations system this leads to decreased of the wave lengths than, and this in turn leads to increase of the storage ability than the data. From this we can conclude that the disks which prepared by basic concentrations are better those prepared at acidic than concentrations.

Keywords: Methyl red (MR), poly methyl methacrylate (PMMA), storage ability, variable angle spectroscopic ellipsometry.

(Methyl red) MR

(Poly methyl methacrylate) PMMA

(Benzil dimethyl ketal) BDK

(Pham *et al.*(b), 1995)

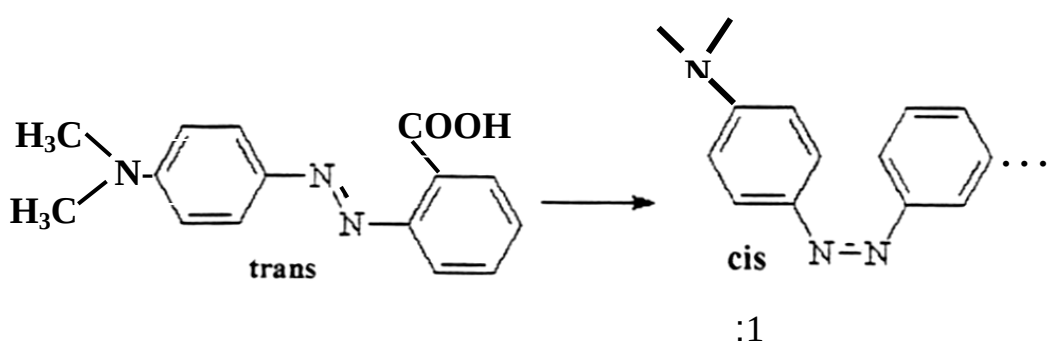
(Pham *et al.*(a), 1995)

PMMA

(Gang *et al.*, 1999)

(Blanchet *et al.*, 2000) (Hologram)

Trans $\Leftrightarrow$ *Cis*



PMMA

(Zhoo and Zhao *et al.*, 2001)

(PMMA)

/Azo-dye

(Day *et al.*, 2001)

PMMA

DR

(Kleideiter *et al.*, 2002)

..... PMMA/BDK/MR

(Al-Attar and Taqataqa, 2003) *Trans* $\Leftrightarrow$ *Cis*

PMMA/BDK/MR

. PMMR/BDK/MR

0.5 gm. MR

50 ml.

MR

pH

MR

HCl

(pH=0,2,4.6)

meter

NaOH

(pH=4.6)

pH meter

0.5 gm.

BDK

(pH=8,11)

50 ml.

50 ml.

0.5 gm.

PMMA

PMMA/BDK/MR

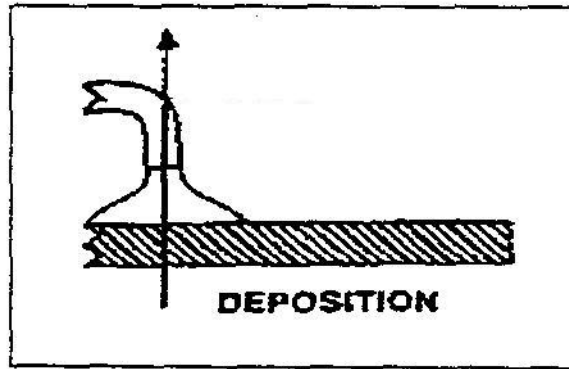
.3PMMA:3BDK:1MR

:Spin casting

:

:

.(2)

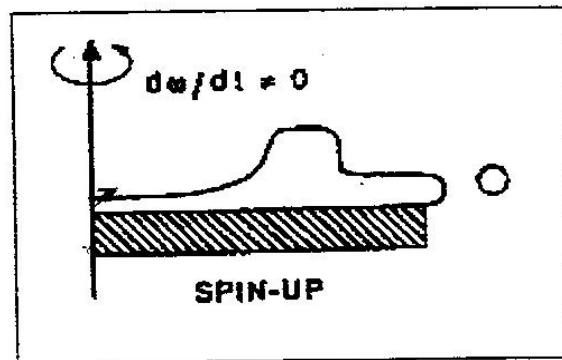


:2

Spin

:

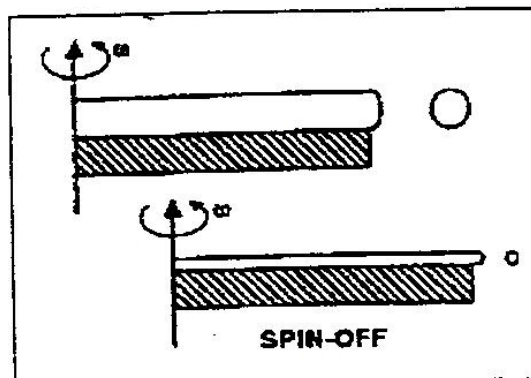
.(3)



:3

:

.(4)



:4

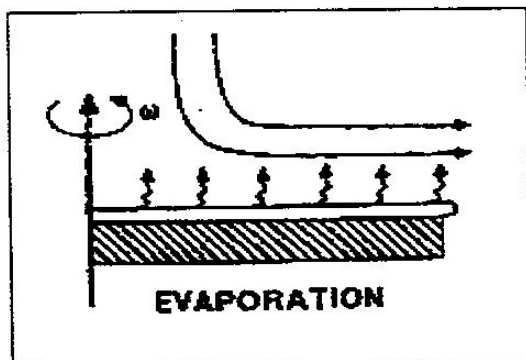
.....

PMMA/BDK/MR

24

:

.(5)



:5

(V.A.S.E) Variable

(250-1000)nm

Angle Spectroscopic Ellipsametry

(Wvase, J.A.Woolan)

(75,70,65)

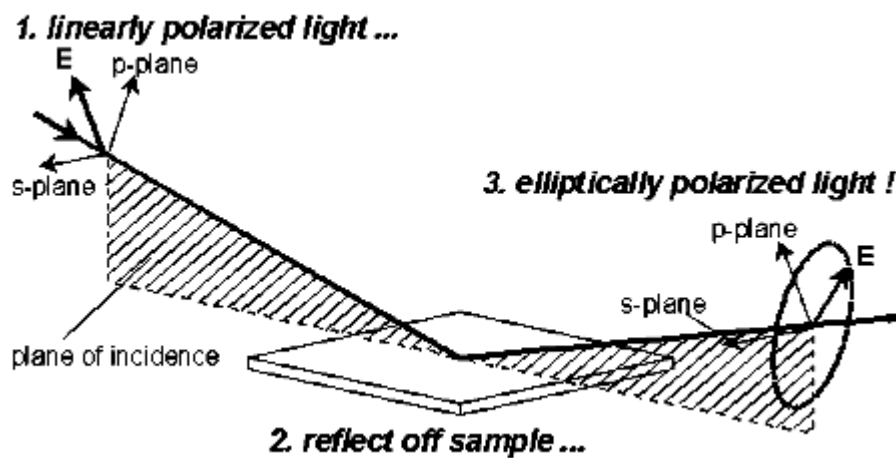
(Fitting)

(Tompkins, 1999), (Azzam and Bashara, 1977) (Un polarized)

(Polarizer)

.(6)

(Elliptic)



:6

(Detector)
 Δ, ψ
 R_s, R_p

$$\tilde{\rho} = \frac{\tilde{R}_p}{\tilde{R}_s} : \dots\dots\dots (1)$$

$$\tilde{\rho} = \tan \psi \exp(i\Delta) \dots\dots\dots (2)$$

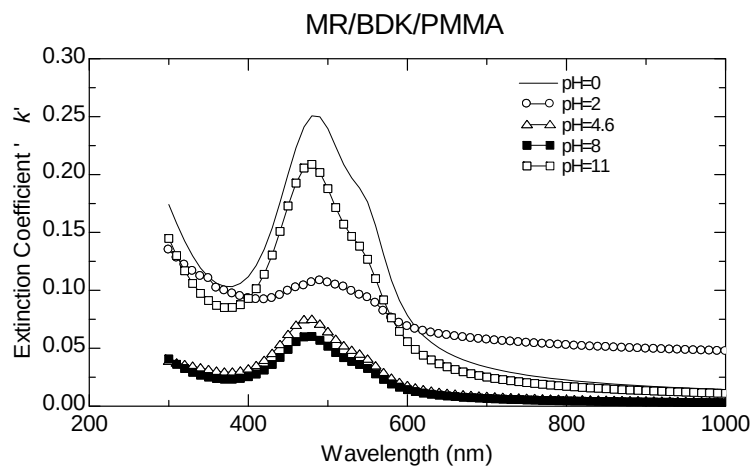
ΔR_s
 $\psi \tan$

R
 ρ
 ψ

(Elman, 1998) Δ, ψ

5%

.(7)



PMMA/BDK/MR

k

:7

(7)

$$E=h \nu \dots\dots\dots(3)$$

$$\nu = \frac{c}{\lambda} \dots\dots\dots(4)$$

: 5 3 4

$$E= h \frac{c}{\lambda} \dots\dots\dots (5)$$

: λ (3×10^8 m/s) : c (6.6×10^{-34} J.s) : h

: (Miles *et al.*, 1986), (Tiwald, 1998)

$$\alpha = \frac{4\pi k}{\lambda} \dots\dots\dots(6)$$

: λ : k : α

(5,6) α E

:(1)

PMMA/BDK/MR

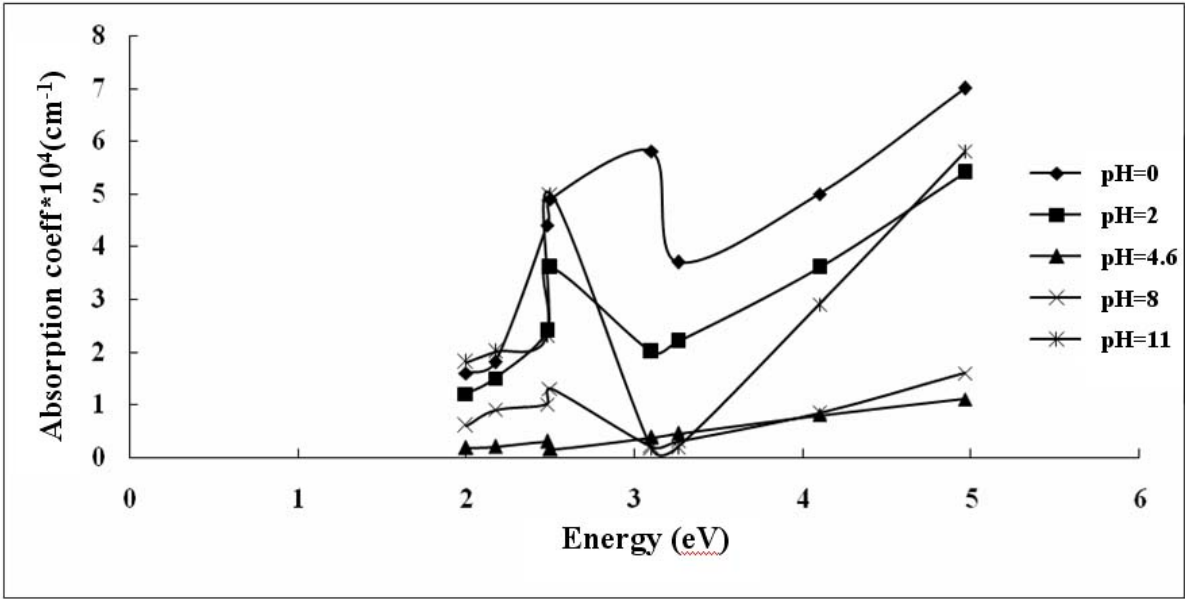
:1

pH=0

λ (nm)	k	$\alpha * 10^4$ (cm ⁻¹)	E (eV)
250	0.17	7	4.96
300	0.1	5	4.1
380	0.12	3.7	3.26
400	0.224	5.8	3.1
480	0.223	4.9	2.5
500	0.2	4.4	2.48
570	0.09	1.8	2.17
600	0.075	1.6	1.6

(8)

α , E



PMMA/BDK/MR α :8

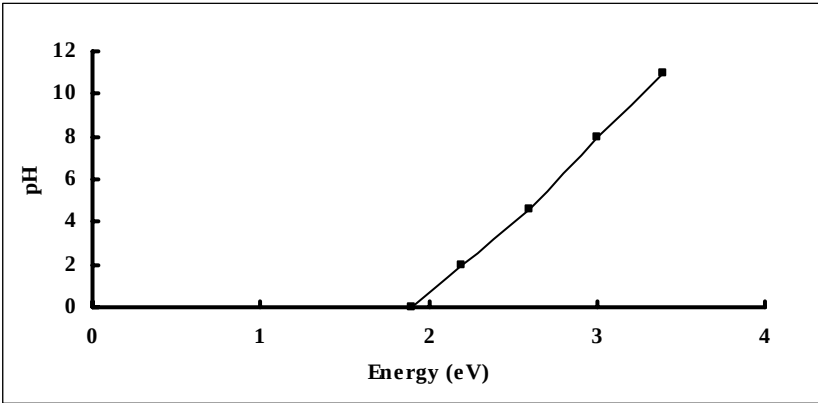
(E_g) (8)

:(2)

PMMA/BDK/MR :2

pH	0	2	4.6	8	11
E_g (eV)	1.8	2.2	2.6	3	3.4

:(9) pH, E_g (2)



PMMA/BDK/MR :9

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PMMA/BDK/MR

(8)

(E=2.5 eV)

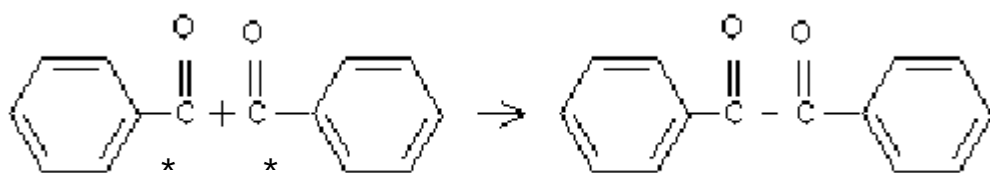
(E=3.1)

BDK

PMMA

OH

.(10)



:10

(9)

:

PMMA/BDK/MR

.1

PMMA/BDK/MR

PMMA

.2

.3

.(2005)

PMMA/BDK/MR

PMMA/BDK/MR

(Azo-dye)

2004

BDK

.64

2005

PMMA/BDK/Azo-dye

.58

- AL-Attar, H., and Tagatqa, O., 2003, Pure and Applied Optics, Journal of Optics, Vol. 5, No. 6, pp.478 – 492.
- Azzam, R., and Bashara, N., 1977, Ellipsometry and Polarized Light, First Edition, North – Holland Physics Publishing, Amesterdam, 8p.
- Blanche, P., and lemaire, M, 2000, Photoinduced birefringence and diffraction efficiency in Azo dye doped or grafted polymers: Theory versus experiment of the temperature influence, J. Opt. Soc. Am. B, Vol. 17, No. 5, pp.729 – 740.
- Collins, R.W., 1990, Automatic rotating element ellipsometers calibration, operation and real time applications, Rev. Sei. Instr. Vol. 61, No. 10, 2029p.
- Elman J.F., J. Greener, C. M. Hertinger, B., johs, 1998, Characterization of bixially – Stretched plastic films by generalized ellipsometry. Journal of molecular structure, Vol. 313, No. 13, pp.814 – 818.
- Gang, S., and Xuchum, P., 1999. Study of the optical properties of thin solid films. Opt. Com, Vol. 563, No. 20, 3049p.
- Keideiter, G.; Sekat, W., and Knoll, 2000, Molecular Spectroscopy and Molecular Structure. Journal of Molecular Structure Vol. 521, No.20, 167p.
- Pham, M., 1995, Modelling Growth Instability in A stressed Solid. Growth and Characterization of Materials, Vol. 9, No. 10, pp.302 – 325.
- Pham, M., 1995, Surface Plasmon Resonance Within Ion Implanted Silver Dusters, Analytical and Bioanalytical Chemistry, Optical Materials, Vol.362, No.1, pp.9–14.
- Tompkins, H.G, and Megaham, W.A., 1999, Spectroscopic Ellipsometry and Reflectivity, A User's Guide, John Wiley and Wons, New York. pp.70–71.
- Tiwald, T.E.; Thompson, D.W., and Woollam, J.A., 1998, Ellipsometric Determination of Optical Constants for Silicon and Thermally Grown Silicon Dioxid. Viamulti –

Sample, Multi – Wave Length, Multi – Angle Investigation. J. Appl. Phys. Vol. 83, No. 20, 3323p.

Mlesv – Klein Thomas. Furtak, 1986. Optics. John Wiley and Sons, pp.70 – 71.

Zhoo, Z.X., and Zhao, X., 2001, Materials Engineering, 170p.

