

(UPE)

(PVC)

(PVAC)

- -

تاريخ القبول: 2007/12/20

تاريخ الاستلام: 2007/5/7

**Polymers Blends**

THF (UPE) (PVAc)  
(UPE+PVAC) ( 11%,12%,13%,14.5%,16%,17%) PVAc

UV

(200 ) 365 nm

(80C0)

UV IR

Thermal aging

PVAC

UV

"

(PVC) ( )

( UPE+PVC )

(UPE )

UV

"

"

"

( PVC )

(UV)

( UV ) ( IR)

"

UV

[9]

**Homopolymers**

**Thermosetting**

[10]

" "

[11] (UV)

(PVC) ( )

**Thermoplastics**

(PVAc)

1972

(UV)

**Polymers Blends**

[1]

"

[2] Geuskens

(PVAc)

(Gel)

[3] ( Chenwar )

.(

[12] Blends

1985 (Strop)

[4]

(Swerson)

**Chromophore**

(Cray and

[5]

"

[13]

"

(PVC)

[6] Cadoff)

(Tg)

"

HCL

[7] (Adam)

"

[14]

(Brown) [8]

(UPE)

(Glassy)

( Adelstein )

PVAC  
(Gel)  
(Blend) PVAC+UPE ) "  
[15] ( )  
PVAC (PVC (PVC) ( )  
:  
UPE (PVC)  
Plasticizer  
(PVC+UPE)  
10 = 38%  
PVC ( ) (Reactive Blend)  
(Compatibler)  
( )  
PVAC  
(Fluka) )  
Benzoyl Peroxide ) [16] ( PE +PS  
68C0 [17]( PE + PP  
15% [18] (C-si + UPE )  
UPE ) organo silico  
Tetra hydro furan PVC ) [19] ( PP +  
(BDH) (THF) [20] ( Ppy +PVC  
(GCR) ( PE + PVC )  
" [21]  
(THF)  
(Gallenhamp) Mixer  
(10) (5)  
(12) .Degradation  
(1)  
0.7 :  
(Dessicator)  
(UV) Outdoor

(1)

Optical microscope) (11%,13%,14.5%,16%,17%  
 500 (Olympus.BH2 ( )  
 . UPE

UV IR )  
 UV (PVC+UPE ) ( PVAC+UPE  
 (365nm) UV  
 النتائج والمناقشة :  
 :Blending Chromato-Vue-C-7s-)  
 200 (UvDark Room  
 )  
 PVC PVAC UPE (PVC+UPE ) ( PVAC+UPE )  
 (1) ( Memmert)

200 ( 80C0)

400 : IR

IR  
 (Pu-a7006Philips)  
 (UV)  
 UV UPE . KBr  
 [21] 200  
 (UV)

(UV) ( PVAC+UPE ) 1820cm-1  
 1980cm<sup>-1</sup>  
 .(PVC+UPE )

(PVAC) : UV  
 [22] U.V-Vis ) UV  
 (Gel Form) double Beam Cintara 5 spectrometer  
 PVAC " (

PVC



17% > 14.5% > 13% > 11% > PVAC [26]  
 : (Virgin)  
 500  
 (PVAC+UPE) ( )  
 (UV) PVAC  
 (UV) [27] UPE  
 (PVAC) (UPE)  
 (10,5)  
 [29] (UPE) " (16%,13%)  
 (5,2) ) (Virgin)  
 (6,3) " [28] (UPE)  
 PVC+UPE (UV)  
 " (11,8) PVC PVAC  
 " (12)  
 [31,30] (PVC+UPE)  
 (12,8,6)  
 (17%,14.5%,13%)  
 :  
 (11) 17%PVC > 16% > 14.5% > 13%  
 > 11% > PVC (Virgin)  
 11% PVC < PVC( :  
 " Virgin)  
 UV (17%,16%,15%,14.5%,13%)  
 (16,15,14)  
 " ( 17%,13%,11%)  
 (PVAC)  
 UPE  
 11%PVAC > 17% > 16% :  
 > 14.5% > 13% > PVAC (Virgin)  
 16% PVAC > UV

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(1)

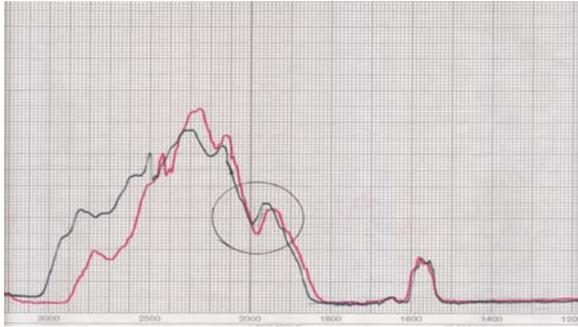
No.		No.	
a	Virgin(UPE)	5	17%PVAC+UPE
b	Virgin(PVAc)	6	11%PVC+UPE
c	Virgin(PVC)	7	13%PVC+UPE
1	11%PVAC+UPE	8	14.5%PVC+UPE
2	13%PVAC+UPE	9	16%PVC+UPE
3	14.5%PVAC+UPE	10	17%PVC+UPE
4	16%PVAC+UPE		

جدول (2) قيم الشدة النسبية (R) للخليط (PVAC+UPE) لاطياف I.R لحزمة امتصاص  $1820\text{ cm}^{-1}$ 

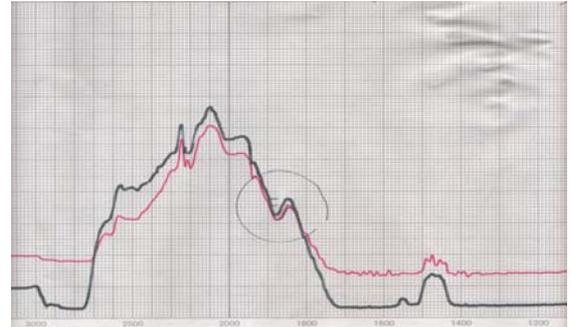
No.	Blend	R	الملاحظات
1	11%PVAC+UPE	0.714	( )
2	11%PVAC+UPE	1.111	( ) UV
3	13%PVAC+UPE	0.767	( )
4	13%PVAC+UPE	0.562	( ) UV
5	14.5%PVAC+UPE	0.625	( ) UV
6	14.5%PVAC+UPE	0.844	( )
7	16%PVAC+UPE	0.987	( )
8	16%PVAC+UPE	0.567	( ) UV
9	17%PVAC+UPE	0.955	( )
10	17%PVAC+UPE	0.807	( ) UV
11	Virgin(PVAc)	0.484	( )
12	Virgin(PVAc)	0.969	( ) UV

جدول (3) قيم الشدة النسبية (R) للخليط (PVC+UPE) لأطياف I.R لحزمة أمتصاص  $1980\text{cm}^{-1}$

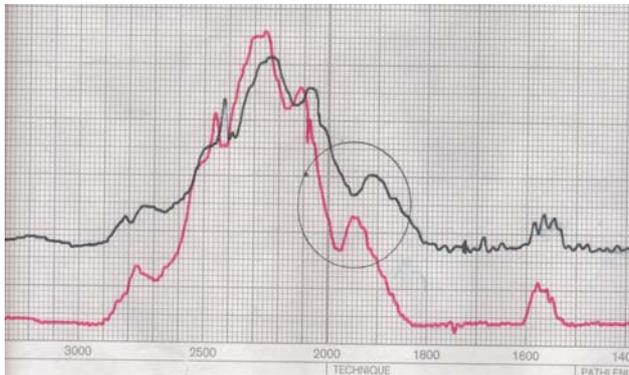
No.	Blend	R	الملاحظات
1	11%PVC+UPE	0.617	( )
2	11%PVC+UPE	0.761	( ) UV
3	13%PVC+UPE	0.477	( ) UV
4	13%PVC+UPE	0.937	( )
5	14.5%PVC+UPE	0.945	( ) UV
6	14.5%PVC+UPE	0.837	( )
7	16%PVC+UPE	0.661	( ) UV
8	16%PVC+UPE	0.507	( )
9	17%PVC+UPE	0.406	( ) UV
10	17%PVC+UPE	0.767	( )
11	Virgin(PVC)	0.727	( )
12	Virgin(PVC)	0.652	( ) UV



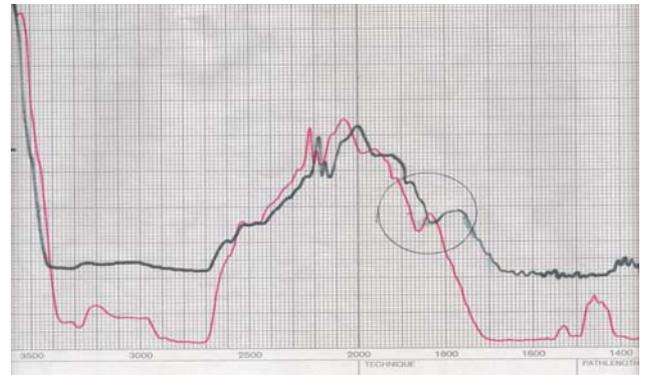
شكل (2) طيف IR لخليط (14.5 % PVC +UPE) بعد التعمير الحراري



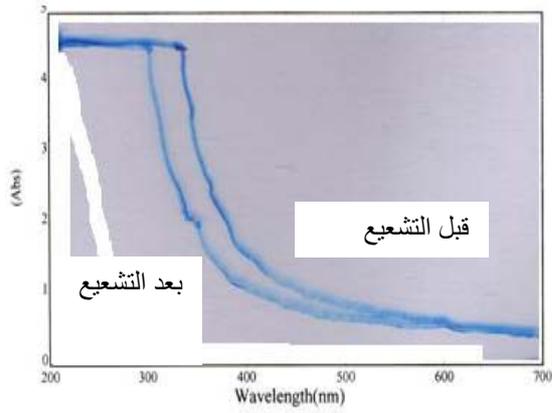
شكل (1) طيف IR لخليط (11% PVAc +UPE) بعد التعمير الحراري



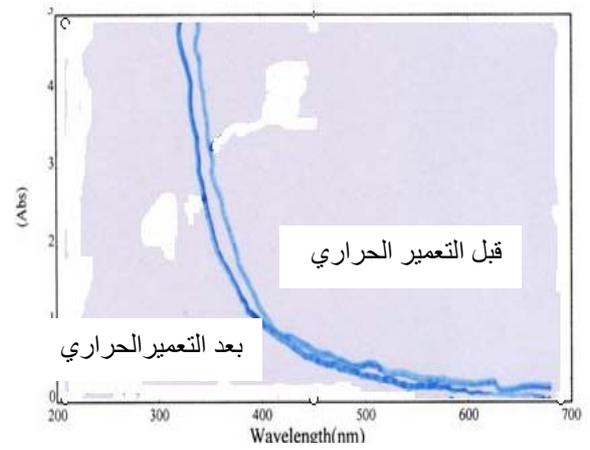
شكل (4) طيف IR لخليط (16 % PVC +UPE) بعد التشعيع الضوئي



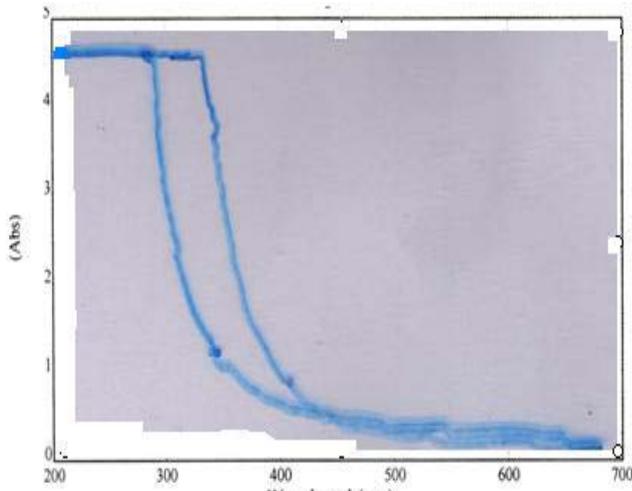
شكل (3) طيف IR لخليط (16% PVAc +UPE) بعد التشعيع الضوئي



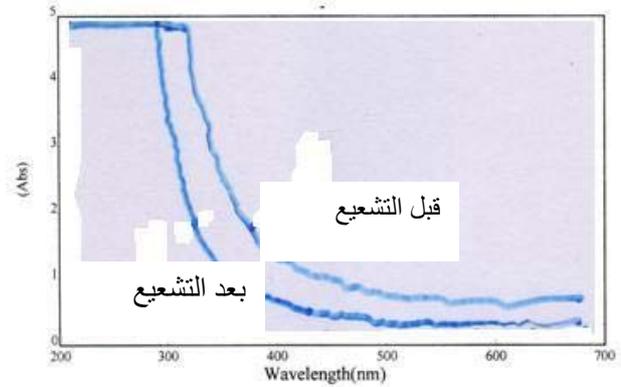
شكل (6) طيف U.V لخليط UPE + ضوئي  
13 % PVC



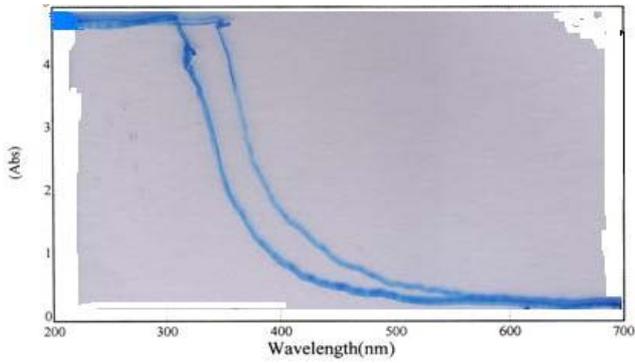
شكل (5) طيف U.V لخليط 13 %  
PVAc + UPE حراري



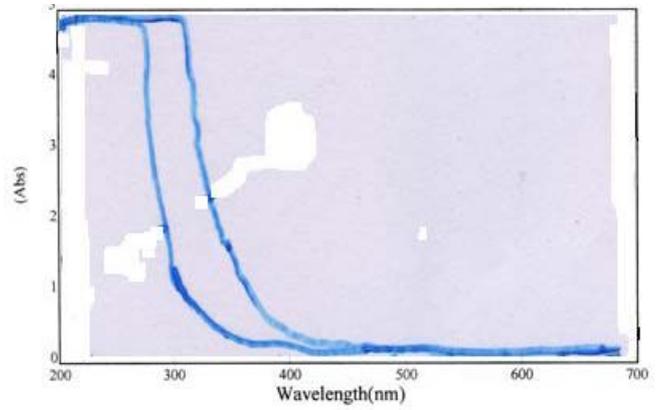
شكل (8) طيف U.V لخليط PVC + UPE 17% ضوئي



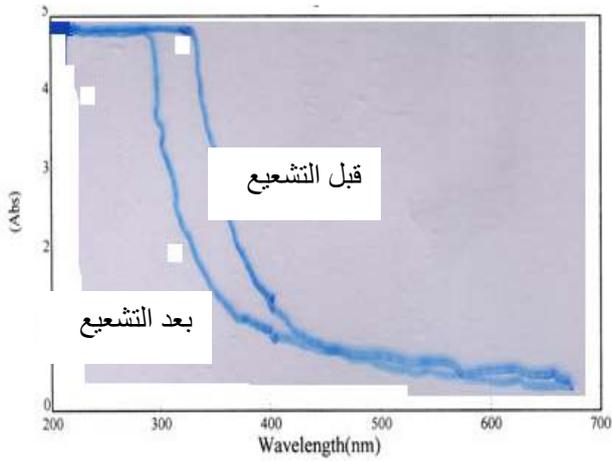
شكل (7) طيف U.V لخليط 13 % PVAc  
+ UPE حراري



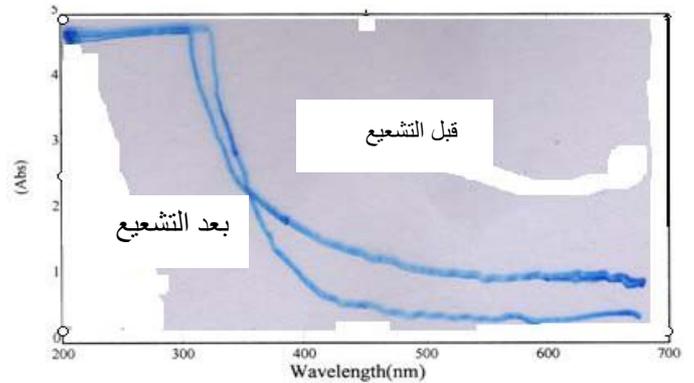
شكل (10) طيف U.V لخليط 16 % PVAc + UPE حراري



شكل (9) طيف U.V لخليط 17% PVAc+ UPE ضوئي



شكل (12) طيف U.V لخليط + UPE 14% PVC ضوئي



شكل (11) طيف U.V لخليط 11% PVAc+ UPE ضوئي



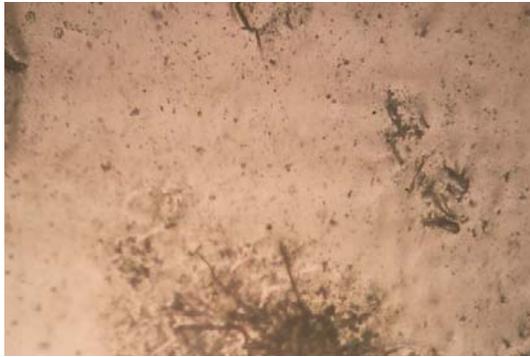
صورة رقم ( 2 ) لخليط 14.5%PVAC + UPA بعد التشعيع



صورة رقم ( 1 ) لخليط 14.5% PVAC + UPE



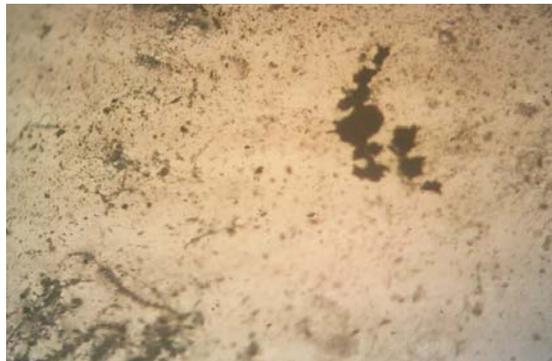
صورة رقم (3) لخليط 14.5%PVAC+UPA بعد التعمير الحراري



صورة رقم ( 5 ) لخليط 17% PVAC + UPA بعد التشعيع



صورة رقم ( 4 ) لخليط 17% PVAC + UPA



صورة رقم ( 6 ) لخليط 17%PVAC +UPE بعد التعمير الحراري



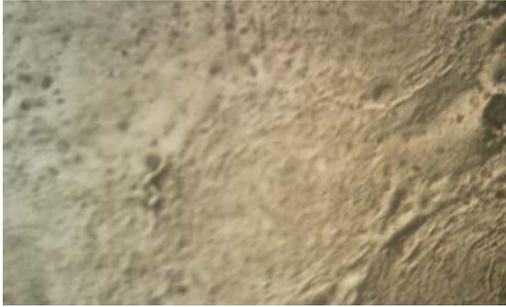
صورة رقم (8) لخليط 13% PVC+UPE بعد التشعيع



صورة رقم (7) لخليط 13% PVC +UPE



صورة رقم (9) لخليط 13% PVC +UPE بعد التعمير الحراري



صورة رقم (11) لخليط 16% PVC +UPE بعد التشعيع



صورة رقم (10) لخليط 16% PVC +UPE



صورة رقم (12) لخليط 16% PVC + UPE بعد التعمير الحراري

## **Preparation and study of a mixture of unsaturated polyester (UPE) with polyvinyl acetate (PVAc) and polyvinyl chloride (PVC) to improve its thermal and photo properties**

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### **Abstract:**

Due to the important applications of the unsaturated polyester under normal climate conditions, this study dealt with polymer blends of this polymer with polyvinyl acetate (PVAc), using tetra hydrofuran (THF) as a solvent according to the following weight to weight ratios (W/W) (11%,12%,13%,14.5%,16%,17%). Films were made from these two polymers and they were exposed to UV light of 365nm as wave length for 200 hours at room temperature continuously. Another set of films were exposed to heat (80C) for the same period (thermal aging).IR , UV and light microscope techniques were used to follow up the thermal and photo degradation of this system.It has been found that the practical results have shown agreement with the proposed theory which indicate that the PVAc undergoes cross-linking reactions rather than chain degradation, also it has been noticed that the effect of UV radiation is more effective in comparison with that of the heat.

By using the same method mentioned above a study on (UPE+PVC) was carried out under the same conditions. It has been noticed that PVC makes the system more stable especially against the UV light and the effect of heat is more significant than that of the radiation because the PVC did not contain the chromophores can be react with light. The photographs that have taken by the photo microscope showed agreement with that of the UV and the IR spectra . In such way that these systems suffered surface oxidative reactions and then cross-linking rather than chain degradation. Better weathering resistant polyblends of (UPE) were obtained in this study towards heat and UV effects.