

/

LDPE
% (30 20 10) 125µm
()
356 (UV)

Preparation and study of Bio-Plastic from leaf palm Powder and its Cellulose Extraction with low density Poly Ethylene

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Abstract

Tow bio environmental Composite where prepared by melting a mixture of polyethylene and a powder of leaf palm and cellulose which is laboratory extracted in a size of 125 µm and in (10, 20, 30) % with a low density poly ethylene (LDPE). Physical and Mechanical properties of these composite where studies including fatigue , stress-strain impact ,fracture, thermal conductivity, swelling in acidic and alkali media, also resistance to high solar radiation (UV) with 365 nm. In general two types of samples showed improved mechanical properties and thermal isolation (low conductivity) better than the standard plastic sample, However, the samples prepared with pure cellulose shows mechanical properties , resistance to moisture ,swell and weather conditions such as radiation(UV) better than the samples prepared from leaf palm powder and was less in the thermal isolation.

This study shows the possibility of using leaf palm to prepare a composite with poly ethylene to produce bio composite of Type of wood for the manufacture of plastic prefabricated houses eco-friendly.

)
) (2,1)
 (4,3) (
 (5)
 (6)
 (8 7)

WPC Wooden Plastic Composite

(9)

Schuts (1999)
 () (10)

Coupling agent Hydrophilic Hydrophobic
 (12,11) Matrax filler
 Nano ()
 Nano Glay
 (14 13) Miscibility
 Stark , N. M (15)

M.A. Rodrigucz (18) (16,17) H.T.Wang, Hansson.L
) (19) (kenaf

(20)

 α - Cellulose

Fluka %99.8 LDPE
 Fluka
 2 3 ()
 () Corens Limited
 INstron 1191 Hi - Tach
 Sheharst Model - 15 Azod ()
 365 UV U.VP

1 10 ()
 90 125 μ m 2mm
 % wt (30 20 10)
 1.5 °137
 (2) (1)
 5 250)) α - Cellulose
 %18 100

Decantation (8)

CS2 6 48
 Shaker
 %5 500

60 Na₂SO₄ %96 H₂SO₄ 50)
 (500 10 C₆H₁₂O₆ 5 ZnSO₄ 350
 α -Cellulose
 (2) ((
 30 25

) Filler

(

(1)

Samples	NO	Size μm	Wt leaf palme	Wt LDPE
Virgin	X	125	--	g 10
LDPE+leaf palme	1	=	g1,2	g8.8
LDPE+leaf palme	2	125	2.2	7.8
LDPE+leaf palme	3	125	3.2	6.8

α - Celloluse

(2)

Sample	NO	Size μm	Wt leaf palme	Wt LDPE
Virgin	Y	125	--	10g
LDPE + α - Celloluse	4	=	1,2g	8.8g
LDPE + α - Celloluse	5	125	2.2 g	7.8 g
LDPE + α - Celloluse	6	125	3.2 g	6.8 g

Fatigue

Alternating Bending

$$\ell=L-h=L-(A^2 \delta \quad \quad \quad (\delta) \quad \quad \quad (\ell)$$

$$\ell=L-0.010 \delta=60-0.010 \delta, A=0.785 \quad \quad \quad (/L)$$

$$\sigma = \frac{6p\ell}{bt^2} \quad \text{Mpa} \quad =\sigma$$

$$\text{Strain} = \varepsilon = \frac{\Delta L}{L_0} = \frac{L-L_0}{L_0} \quad \quad \quad = \varepsilon$$

$$\text{Stress} = \delta = \frac{p}{A}$$

$$\ell = L \text{ (MPa)} = \delta = L_0$$

$$5N) = p = t = b () =$$

$$= A \text{ Mpa} = p \quad / \quad 1500 \quad . ($$

un notch izod impact

$$. (21) \text{ kJ / m}^2$$

Ligno- γ -Cellulos α -Cellulos)

(Cellulos

	Yield Stress	Yield Point
(22)	-	
Deflection	Fatigue	
4)	.(5N)	
1)		(α)
	(4)	(6 5)
		(3 2)

(23)

(3 2 1)

(6 5 4)

	(24)	(5)	(7)	
				% Swelling
(120)				
(8)		UV		
α - Cellulose		(7) (6)	356 (9)	
LDPE			4N	
UV			α -Cellulos	

0.4 N NH₄OH

Cross –linkag . (9) (8) (11) (10)

Matrix Filler (α)

Paking
(25)

(3 2 1)
(γ- Cellulos , Ligno- cellulos , α- Cellulos , Plant cell)

UV .(25) (6 5 4)

UV

()

()

.(26) Photo degradation

(1
(2
(3

(3)

Sample	Composite	Impact test kj /m2
X	100% LDPE	15.1
1	10 % Leaf palm + LDPE	17.5
2	20 % Leaf palm + LDPE	20.2
3	30 % Leaf palm + LDPE	23.6
Y	100% LDPE	15.1
4	10 % α – Cellulose + LDPE	15.8
5	20% α – Cellulose + LDPE	16.6
6	30 % α – Cellulose + LDPE	18

(4)

Sample	Stress (MPa) $\bar{\sigma}$ - Strain (ϵ)						
	X	Stress	3.4	6.5	6.7	7.2	8.3
	Strain	0.03	0.04	0.05	0.06	0.08	0.1
1	Stress	2.98	3.8	5.7	8.4	8.6	10
	Strain	0.07	0.014	0.0160	0.021	0.025	0.033
2	Stress	2.8	3.5	5.8	8.2	8.8	9.4
	Strain	0.02	0.024	0.034	0.040	0.055	0.064
3	Stress	2.3	3	5.7	6.5	7.1	9.0
	Strain	0.017	0.027	0.039	0.050	0.060	0.080

 α - Cellulos

(5)

Sample	Stress (MPa) $\bar{\sigma}$ - Strain (ϵ)						
	Y	Stress	3.4	6.5	6.7	7.2	8.3
Strain		0.03	0.04	0.05	0.06	0.08	0.1
4	Stress	2.68	4.1	6.3	7.2	7.4	9.1
	Strain	0.01	0.018	0.023	0.031	0.045	0.077
5	Stress	2.2	3.1	6.5	7.3	7.8	9.8
	Strain	0.006	0.011	0.024	0.038	0.050	0.069
6	Stress	1.9	2.4	5.0	6.9	8.3	10.5
	Strain	0.005	0.007	0.010	0.019	0.028	0.040

(6)

Sample	Composite	Deflection	No Cycles
X	LDPE	6.100	7010
1	LDPE + 10%Leaf palm	4.200	10220
2	LDPE + 20%Leaf palm	3.5	14520
3	LDPE + 30%Leaf palm	2.31	19320
Y	LDPE	6.100	7010
4	LDPE + 10% α - Cellulos	2.12	14145
5	LDPE + 20% α - Cellulos	1.70	20204
6	LDPE + 30% α - Cellulos	1.40	26506

(TC)

(7)

Sample	Composite	Thermal Conductivity(TC)
X	LDPE	0.425
1	LDPE + 10%Leaf palm	0.412
2	LDPE + 20%Leaf palm	0.402
3	LDPE + 30%Leaf palm	0.382
Y	LDPE	0.425
4	LDPE + 10% α - Cellulos	0.420
5	LDPE + 20% α - Cellulos	0.415
6	LDPE + 30% α - Cellulos	0.408

4N H₂SO₄ 120 % (8)

UV				
Sample	Composite	Wt Dry	Wt Wet	% Swelling
X	LDPE	0.120	0.280	28.000
1	LDPE + 10%Leaf palm	0.120	0.132	33.000
2	LDPE + 20%Leaf palm	0.120	0.128	28.000
3	LDPE + 30%Leaf palm	0.123	0.440	44.000
UV				
X	LDPE	0.120	0.166	66.000
1	LDPE + 10%Leaf palm	0.120	0.150	50.000
2	LDPE + 20%Leaf palm	0.120	0.156	56.000
3	LDPE + 30%Leaf palm	0.120	0.122	60.00

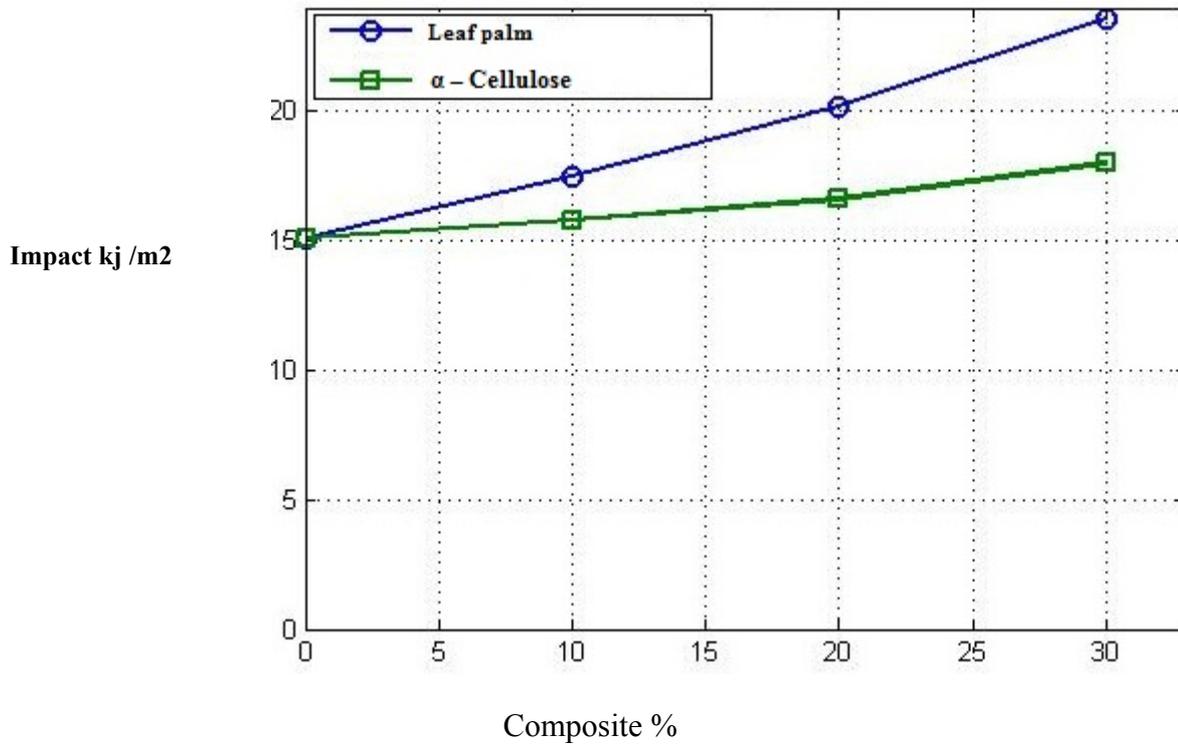
4N H₂SO₄ 120 α - Cellulose % (9)

UV				
Sample	Composite	Wt Dry	Wt Wet	% Swelling
Y	LDPE	0.120	0.42	22
4	LDPE + 10% α - Cellulose	0.120	0.29	29
5	LDPE + 20% α - Cellulose	0.120	0.300	30
6	LDPE + 30% α - Cellulose	0.120	0.390	39
UV				
Y	LDPE	0.120	0.600	60
4	LDPE + 10% α - Cellulose	0.120	0.400	36
5	LDPE + 20% α - Cellulose	0.120	0.360	40
6	LDPE + 30% α - Cellulose	0.120	0.500	50

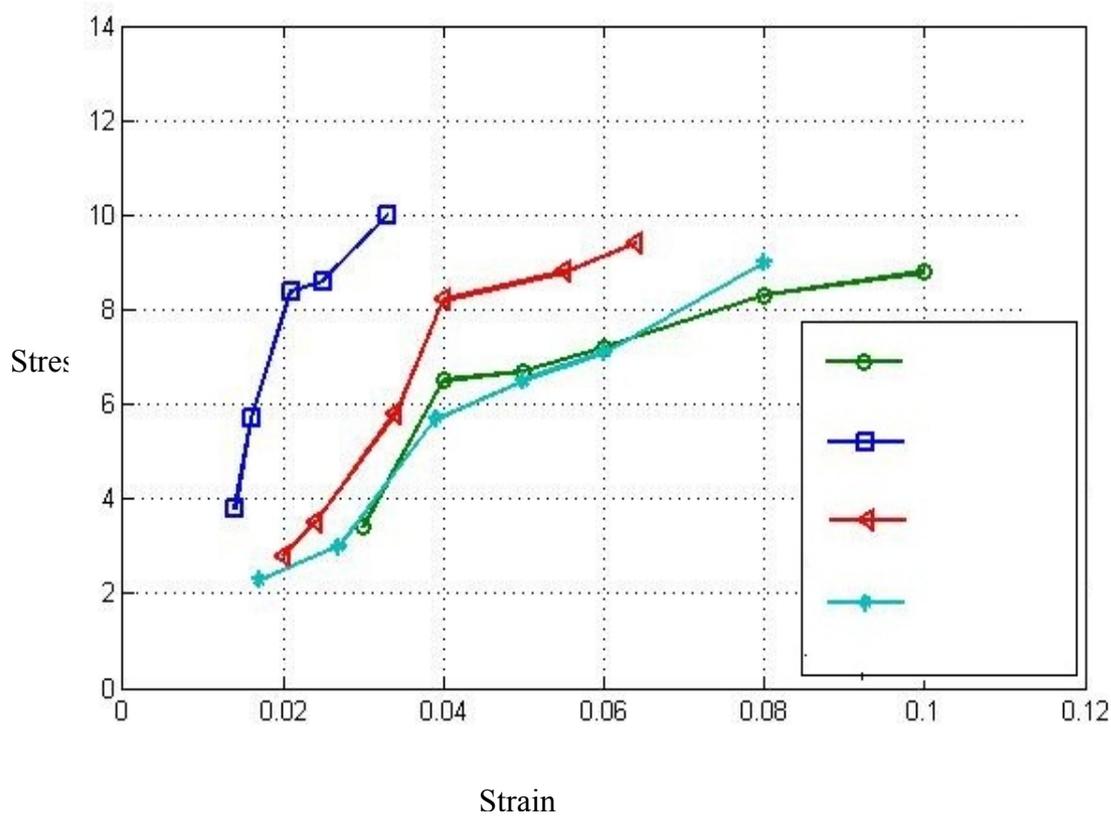
NH₄OH 120 % (10)**4N**

UV				
Sample	Composite	Wt Dry	Wt Wet	% Swelling
X	LDPE	0.120	0.147	47
1	LDPE + 10%Leaf palm	0.121	0.141	41
2	LDPE + 20%Leaf palm	0.121	0.137	37
3	LDPE + 30%Leaf palm	0.123	0.134	34
UV				
X	LDPE	0.120	0.150	51
1	LDPE + 10%Leaf palm	0.120	0.145	47
2	LDPE + 20%Leaf palm	0.120	0.141	42
3	LDPE + 30%Leaf palm	0.120	0.136	38

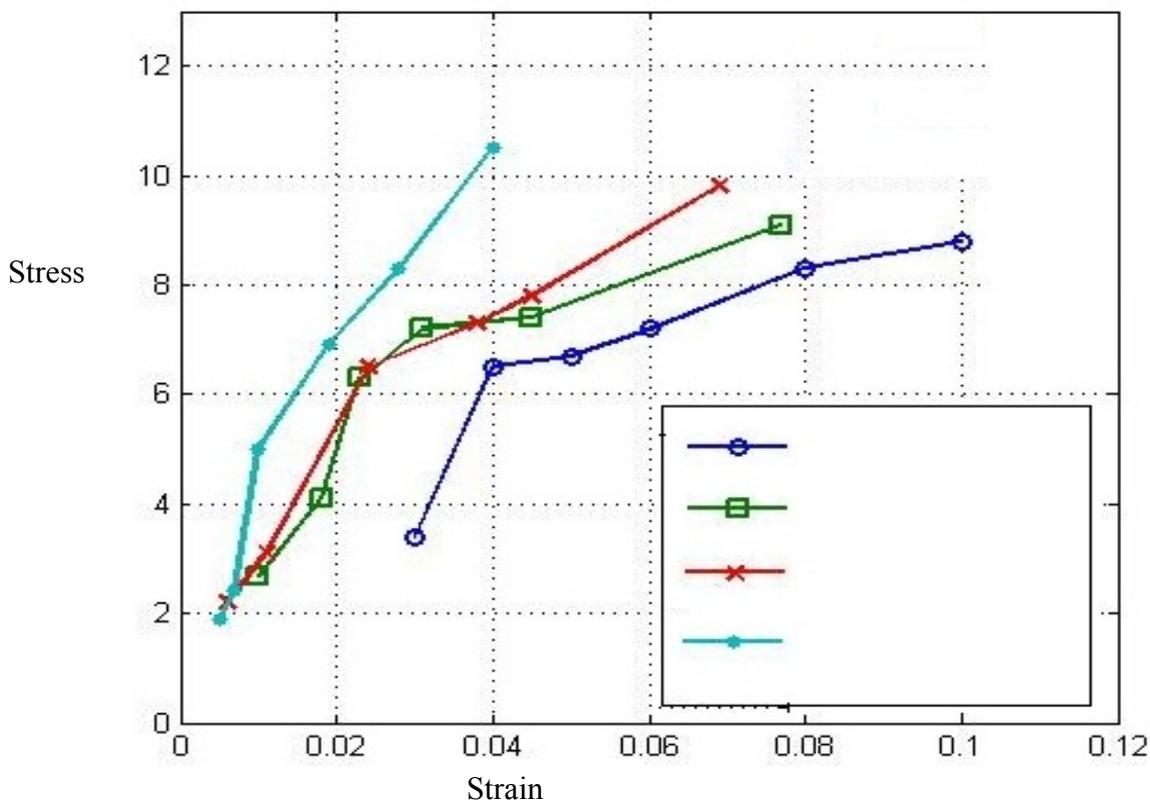
4N NH ₄ OH 120 α - Cellulos % (11)				
قبل التشعيع بـ UV				
Sample	Composite	Wt Dry	Wt Wet	% Swellin g
Y	LDPE	0.121	0.141	41
4	LDPE + 10% α - Cellulose	0.121	0.350	35
5	LDPE + 20% α - Cellulose	0.120	0.133	33
6	LDPE + 30% α - Cellulose	0.120	0.132	32
بعد التشعيع بـ UV				
Y	LDPE	0.120	0.150	50
4	LDPE + 10% α - Cellulose	0.120	0.140	40
5	LDPE + 20% α - Cellulose	0.120	0.137	37
6	LDPE + 30% α - Cellulose	0.120	0.136	35



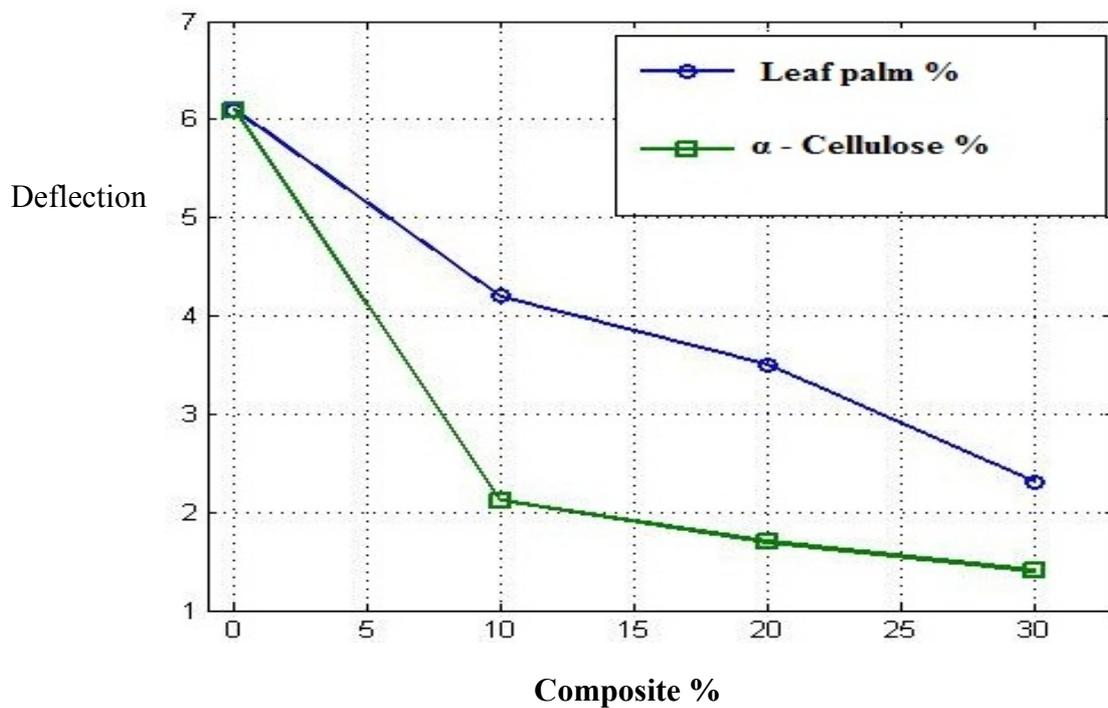
شكل (1).



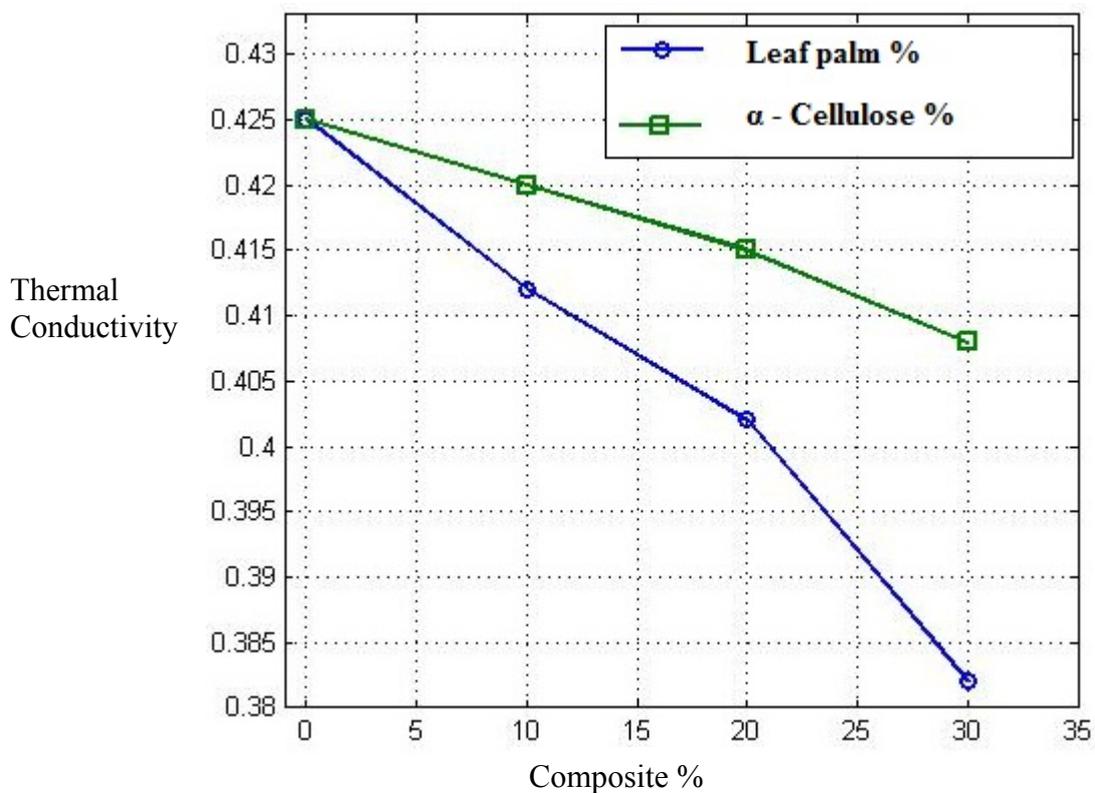
شكل (2).



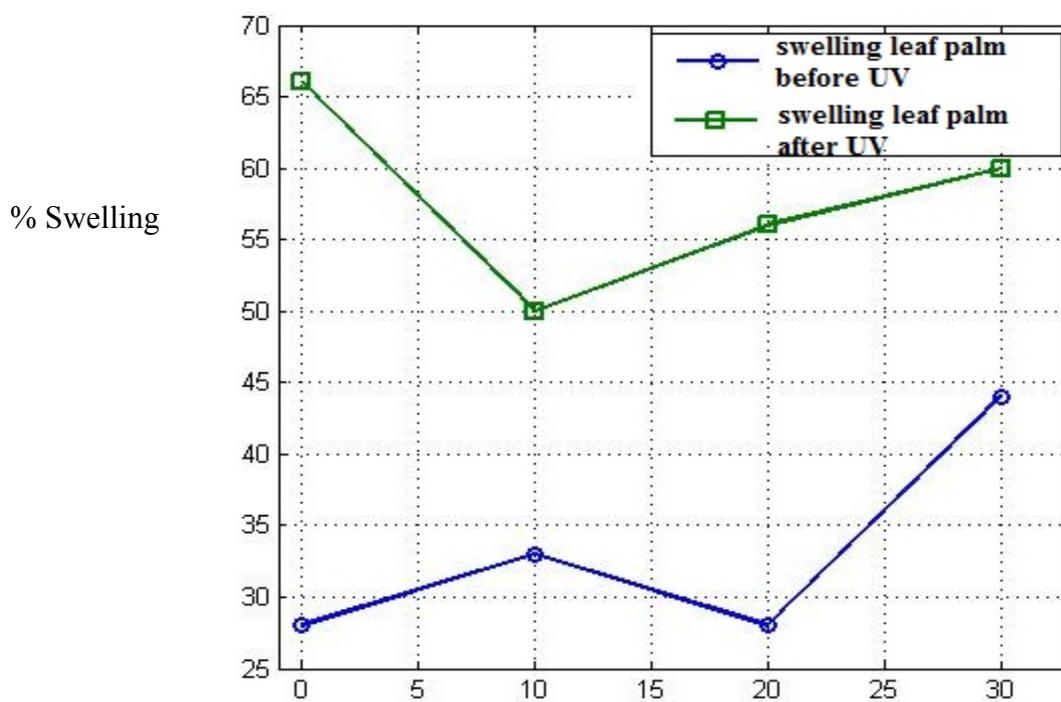
شكل (3). قيم الشد والأنفعال للمترابكات مع α -Cellulos



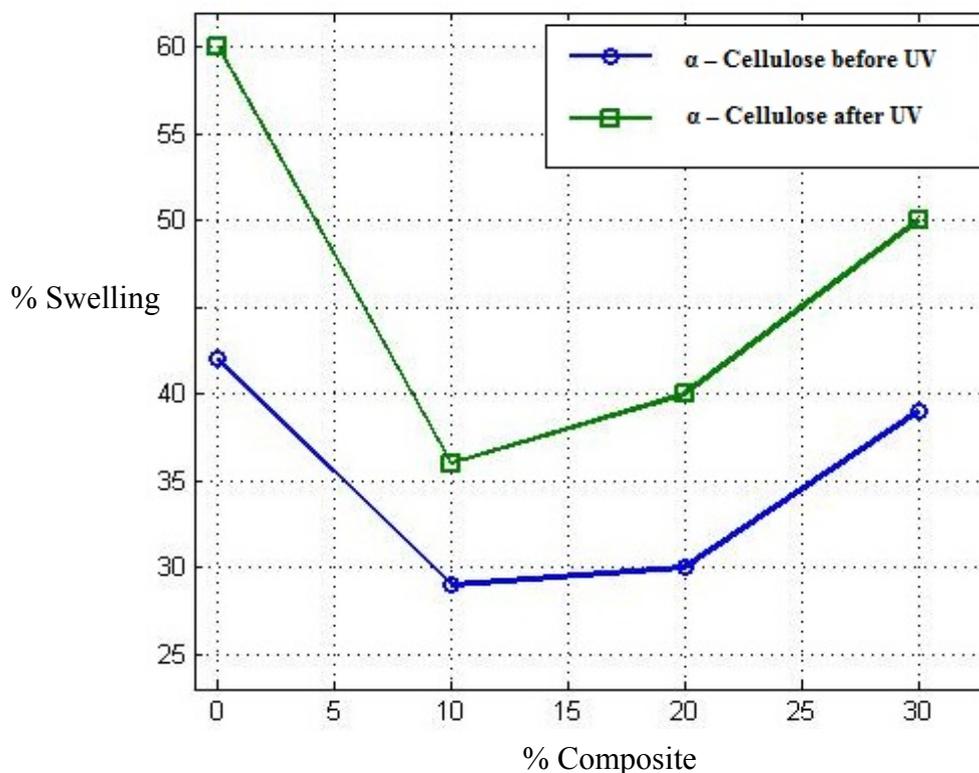
شكل (4).



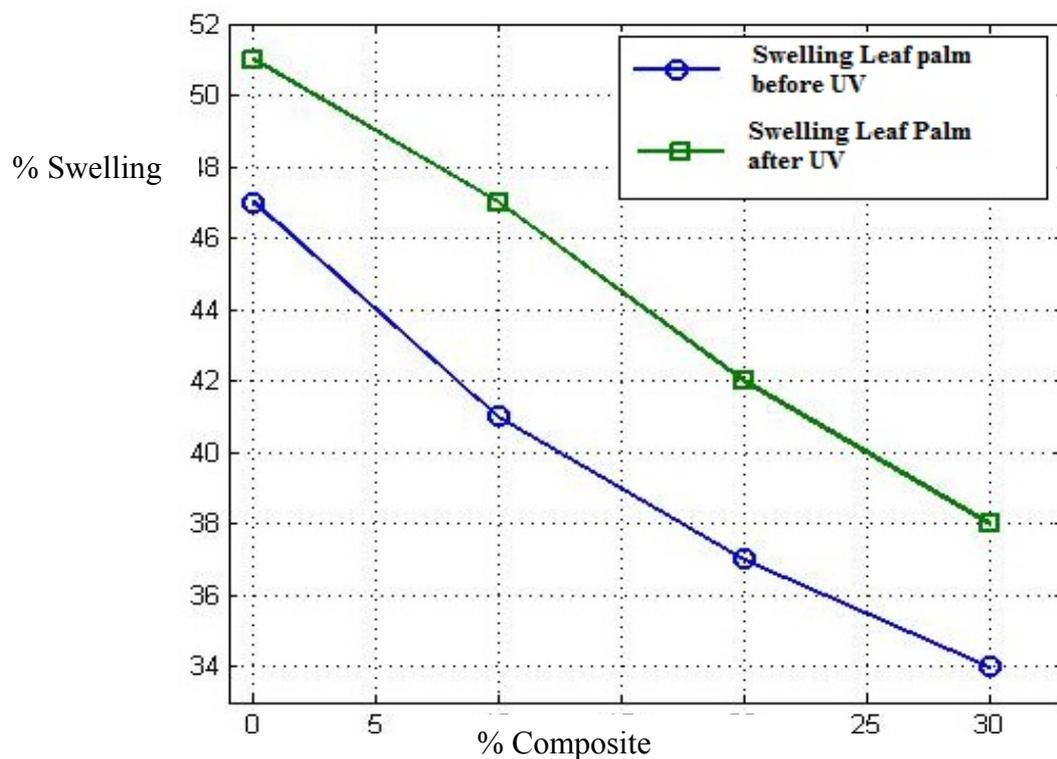
شكل (5). قيم التوصيلية الحرارية (TC) للعينات المتراكبة



شكل (6). % الانتفاخ للعينات المدعمة بمسحوق سعف النخيل بعد الغمر 120 ساعة في $4N H_2SO_4$

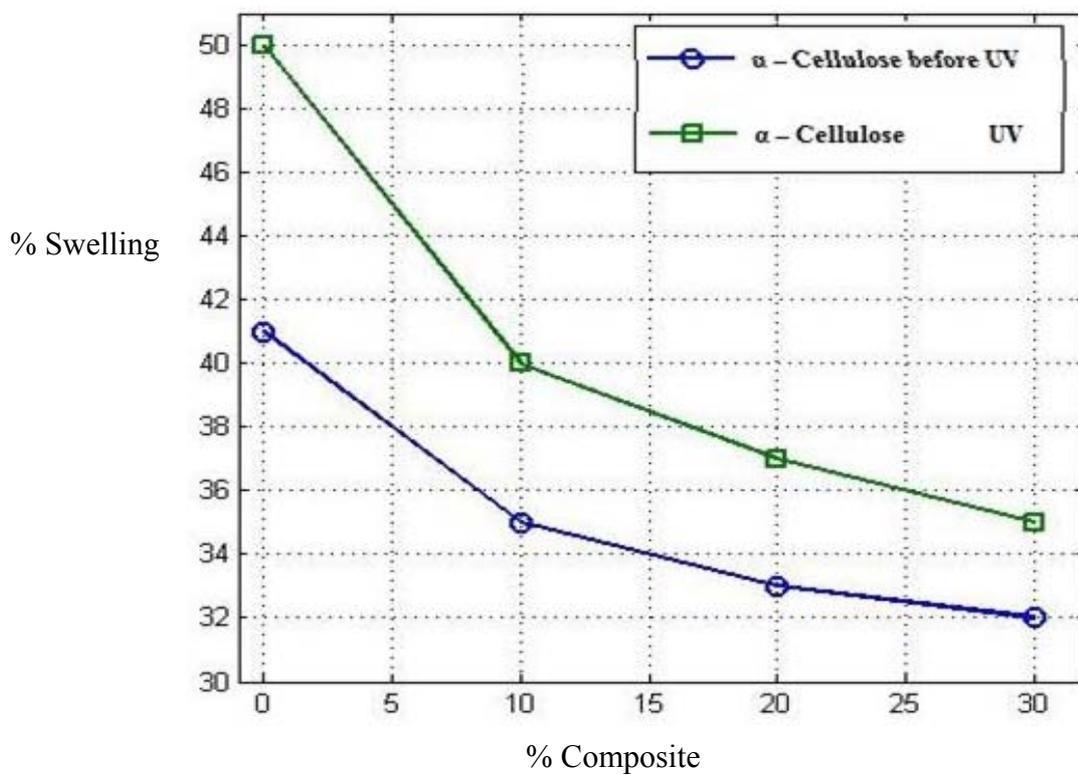


شكل (7). % للانتفاخ للعينات المدعمة α - Cellulose بعد الغمر 120 ساعة $4N H_2SO_4$

4N NH₄OH

120

%. (8)



شكل (9). % للانتفاخ للعينات المدعمة α- Cellulos بعد الغمر 120 ساعة 4N NH₄OH

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