

(2012 / 7 / 18 2012 / 1 / 30 )

.%30 (15-20)  
(K)  
(K<sub>c</sub>) (E)  
(K)  
:

## **Effect of Temperature on Mechanical and Thermal Properties of Polyester Matrix Reinforced by Ordinary Glass Powder**

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### **ABSTRACT**

The research focuses on the preparation composite material containing glass powder of grain size (10-15) $\mu$  reinforced polyester with volume fraction 30%. Many tests have been done in different temperature conditions including Bending test, Hardness, Impact and Thermal conductivity (K).

The results show that Young's modulus ( $E$ ) decreases and fracture toughness ( $K_c$ ) for composites increase with increasing temperature, but Brinnels hardness decreases with increasing temperature. The result also shows that thermal conductivity ( $K$ ) increases with increasing temperature.

**Keywords:** Effect of temperature, polyester, ordinary glass powder.

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(Fillers)                      (Matrix)

(Grawford, 1987; Askeland and Phule, 2006; Callister, 2006)

.

(Jain *et al.*, 1979)

.

(George, 1981)

80%                                      (10-14)

.

(Apicella, 1982)

(40-140) °C

.

(Dewimille and Bunsell, 1983)

.

.100 °C

(Lhymn and Schultz, 1987)

Polyphenylene sulphide (pps)

.

.....

(1992 )

(E-glass)

(Deyaa and Medhat, 2000)

(Thanon, 2006)

(2010 )

(15-20)

(Hand lay up)

<sup>3</sup> / 1.25

<sup>3</sup> / 1.2

2% (MEKP)

(15-20)

30%

0.5%

(Kleinholz and Molinier, 1986)

.(ASTM 07900) (ISO - 179)

70

(CEAST)

(Notch Machine Instrument)

.(0.5,1,1.5,2,2.5,3)mm (*a*)

/

(Phywe)

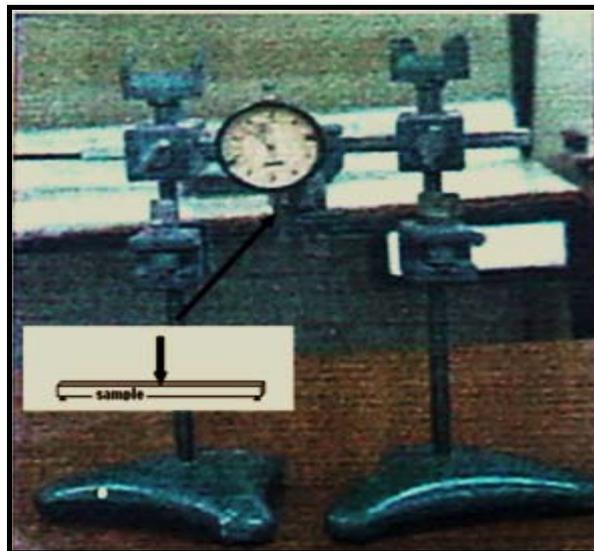
(2) (1) (E) .(1)

:(Thanon, 2006)

$$E = \frac{MgL^3}{48IS} \tag{1}$$

$$I = \frac{BD^3}{12} \tag{2}$$

$I$   $L$   $g$  (gm)  $M$  (N/m<sup>2</sup>)  $E$  :  
 $D$   $B$  (mm)  $S$



:1

Charpy Impact Instrument, Testing Machines INC., )

$K_c$  (Amityville, New York

. ( Bikales, 1987) (4) (3)

$$K_c = \sqrt{EG_c} \tag{3}$$

$G_c$   $E$  :

$$G_c = \frac{U_c}{BD\Phi} \tag{4}$$

.....

$\Phi$  .  $D$   $B$   $U_C$  :

:(Bikales, 1987) (5)

$$\Phi = 0.135 \left(\frac{a}{D}\right)^{-0.77} \tag{5}$$

$a$  :

$P$  2.5 (Leybold Harris No. 36110)

:(Thanon, 2006) (6)

$$B.Hr = \frac{P}{\pi d_1 t} = \frac{2P}{\pi d_1 \left(d_1 - \sqrt{(d_1^2 - d_2^2)}\right)} \frac{Kg}{m^2} \tag{6}$$

$d_2$  (mm)

$t$  (mm)

$d_1$  :

(mm)

(Lee)

(7)

(K)

(Griffen and George)

.(Thanon, 2006) (8)

$$K \left( \frac{T_A - T_B}{d_s} \right) = e \left( T_A + \frac{2}{r} \left[ d_A + \frac{1}{4} d_s \right] T_A + \frac{1}{2r} d_s T_B \right) \tag{7}$$

$(d_A, d_B, d_C)$

$A, B, C$

$(T_A, T_B, T_C)$  :

e

$r$

$d_s$

$A, B, C$

:(8)

$$IV = \pi r^2 e (T_A + T_B) + 2\pi r e \left[ d_A T_A + d_s \frac{1}{2} (T_A + T_B) + d_B T_B + d_C T_C \right] \tag{8}$$

.( )

$V$  ( )

$I$  :

(Memert)

.(150) °C

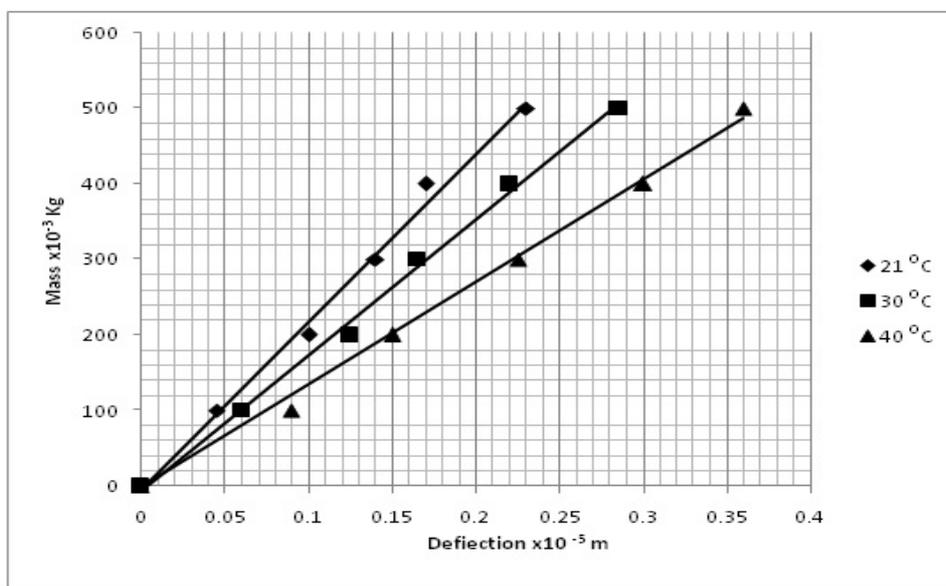
$$\left( \frac{M}{S} \right) \tag{2}$$

.(21, 30, 40) °C

(2)

.(Elastic)

.(Hooks' law)



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(3)

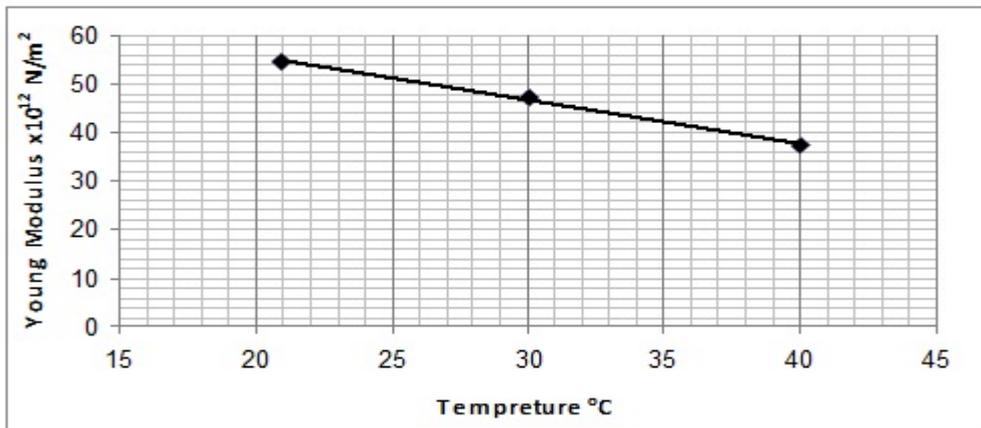
(3)

( )

(Lhymn and Schul, 1987)

.(Lhymn and Schul, 1987)

.....

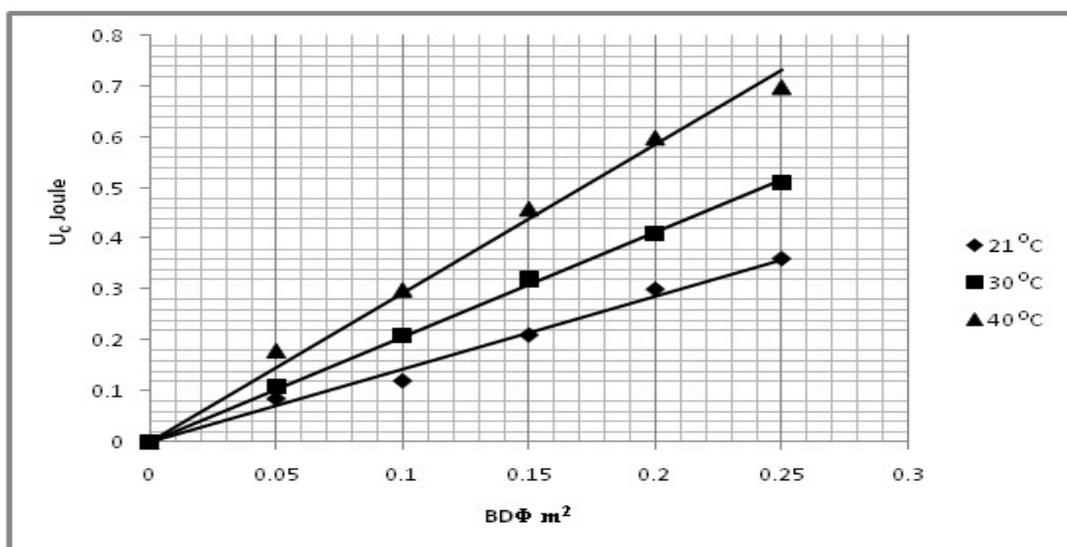


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(BDΦ) (U<sub>c</sub>) (4)  
 (0.5,1,1.5, 2, 2.5, 3) mm

(BDΦ) (4) .(21, 30, 40) °C

(3) G<sub>c</sub> .(Platti, 1975)  
 .(21, 30, 40) °C



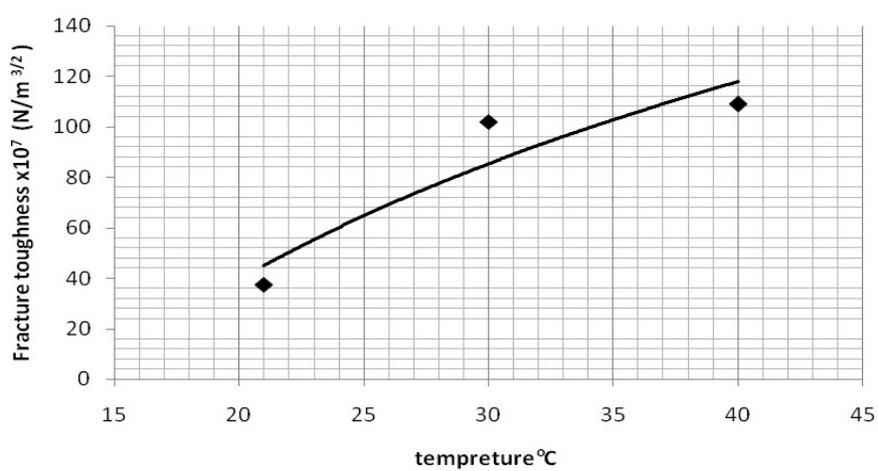
mm a )) : 4  
 .(21, 30, 40) °C ((0.5,1,1.5,2,2.5,3)

(5) (1)

.(1992 )

:1

°C	$K_c (N/m^{3/2}) \times 10^7$
21	37.5
30	102.01
40	109



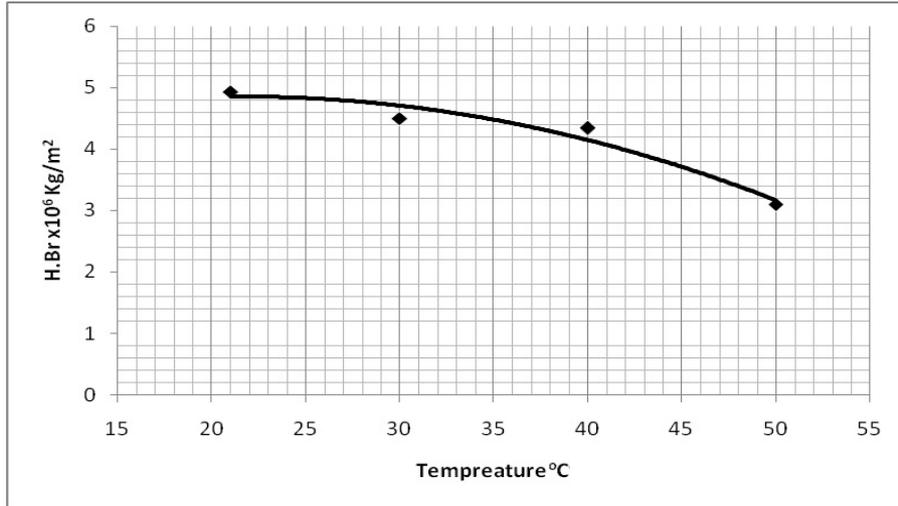
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.(6)

)

.(2010)

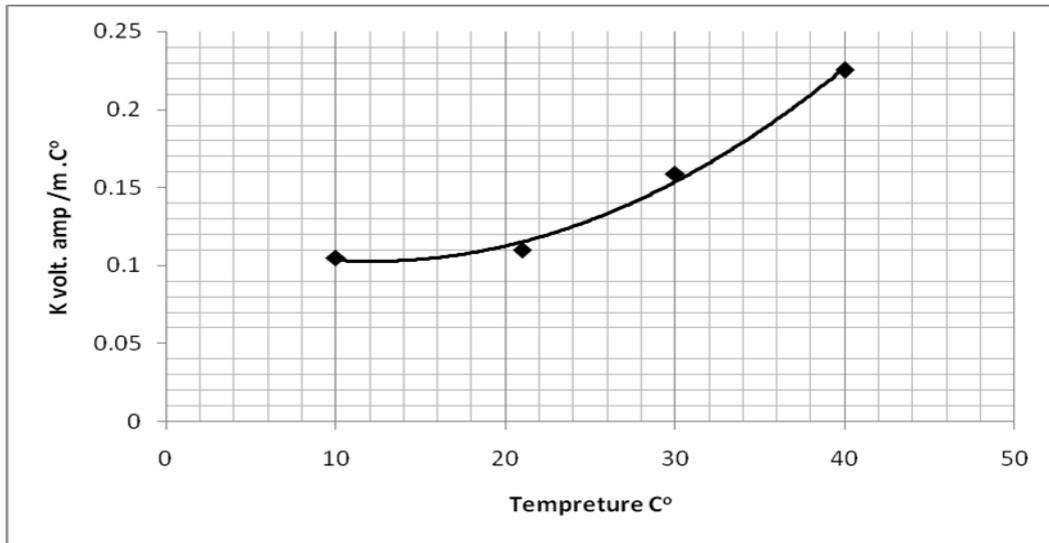
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(7)

.(8) (7)



:7

:	.1
.	.2
( $K_c$ )	.3
.	.4
.	.5
.	.6
.(2010)	

.692-700 (13)28

" (1992)

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