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MICROHARDNESS OF SUPERMOLECULAR POLYETHYLENE AND ITS COMPOSITE

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Abstract. *The effect of extrusion extraction on the microhardness and yield strength of ultrahigh molecular weight polyethylene and its composite is investigated. It was found that the main factor influencing the value of microhardness is the degree of anisotropy of the studied materials, characterized by the molecular degree of extraction. The differences in microhardness values measured parallel and perpendicular to the extrusion direction at the same degrees of extraction are due to the predominant orientation of initially anisotropic polymer crystallites from folded chains. It is shown that for ultrahigh molecular weight polyethylene and a composite based on it, the degree of anisotropy plays a dominant role in determining microhardness. It is established that the relationship between the microhardness of anisotropic materials and the yield strength is described by the same equations as in the case of isotropic materials.*

Keywords: microhardness, composite, anisotropy, bauxite, polyethylene, degree of extraction, yield strength, degree of crystallinity, modulus of elasticity.

[1, 2],

[3].

« » ,

[4, 5].

[6]

[7].

[8-10].

-10^6

-45

%. [11].

[12]

403

()

393 (-).

$$\lambda = d_1^2 / d_2^2, \quad d_1, d_2 -$$

433

100

$$[8]: \quad = L/L_0 (L \quad L_0-$$

).

λ ,

[9]:

$$\lambda = \lambda / (1-\phi), \quad -$$

5-10

10-15

15

[12]

$$2,5 \times 10^{30^{-1}}$$

293

4,5

μ

[13, 14].

-3

0,5

15-20

()

().

[1],

$$= K + (1-K) \quad ,$$

(1)

$K -$

;

$H -$

$$H \ll [1] \quad (1)$$

(1)

$=$

(2)

. 1

||

, \perp ,

$$\lambda (\lambda \leq 9).$$

(2),

$$\parallel(\) \quad \perp(\)$$

||

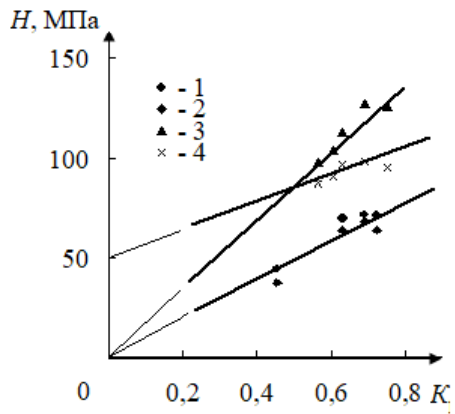
(\perp)

() .

()

$$\lambda \leq 10$$

[2]



. 1.

(3, 4).
(2, 4)

K (1, 2)
(1, 3)

(2)

[2]

172

(1).

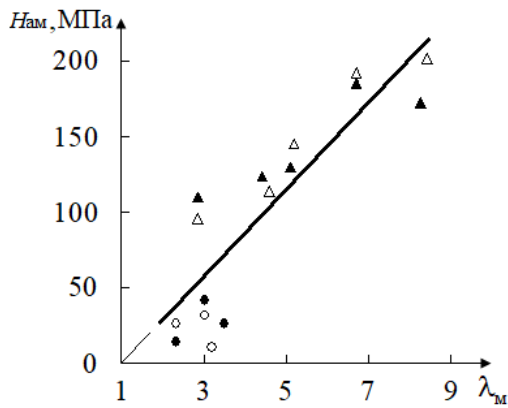
(1)

λ (λ)

λ ,

$\cong 24 \lambda$.

(3)



. 2.

(1, 2)

(3, 4).

. 1

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(

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$\parallel(\lambda)$ $\perp(\lambda)$

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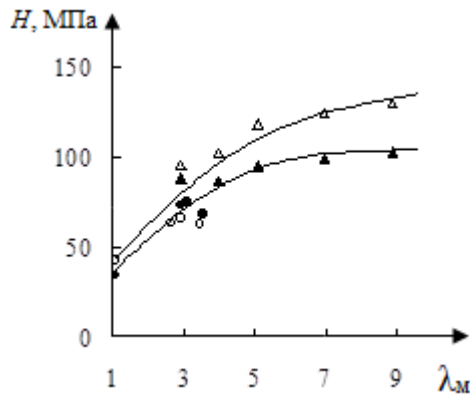
. 1.

[15],

λ .

\parallel \perp

λ



.3.

(, .1)

(4)

$$= K + 24\lambda (1 - K). \tag{4}$$

(, λ (,) , .3

λ (4)

σ . [4]

(5)

$$= 3\sigma \tag{5}$$

σ [1] , [4].

~ 30 [4]. $6 \quad 12,$

[4]

$$H = \frac{2}{3} \left[1 + \ln \frac{E}{3(1-\nu)\sigma} \right] \sigma . \tag{6}$$

[4]

$$H \cong \left(0,07 + 0,6 \ln \frac{E}{\sigma} \right) \sigma . \tag{7}$$

[3]

$$H = \left(1 + \frac{2}{R} \right) \sigma , \tag{8}$$

R

$$R = \frac{\sigma_n}{\sqrt{2\tau_n}} , \tag{9}$$

$\sigma_n \quad \tau_n -$

.4

,

[16]:

(5), (7) (8).

σ

R

-

$$R = \frac{\nu B'}{4(1-\nu)^{1/2}}, \quad (10)$$

[16]

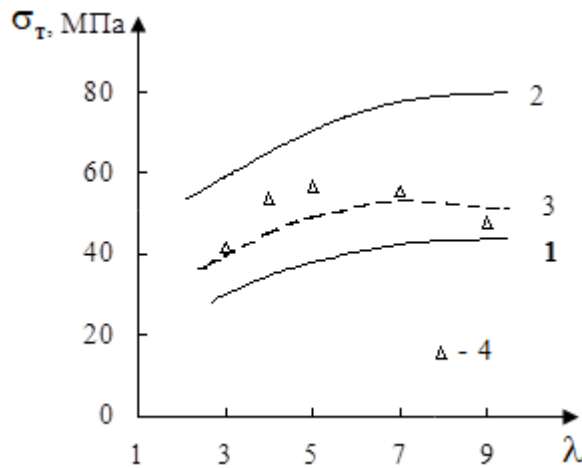
$$B' = \left(\frac{\partial B}{\partial P} \right)_r = 2(m+n+1) \quad (11)$$

$m \ n -$

- ,

12 6,

[13].



.4.

(5), 2 -

(8), 3 -

(7). -

λ . 1 - :

.4,
 σ ,

: $\sigma \cong 2,3$.

3 1,6,

σ

(. 5),

$\sigma \cong 3$

(6) $\sigma \cong 2,5 -$

(7).

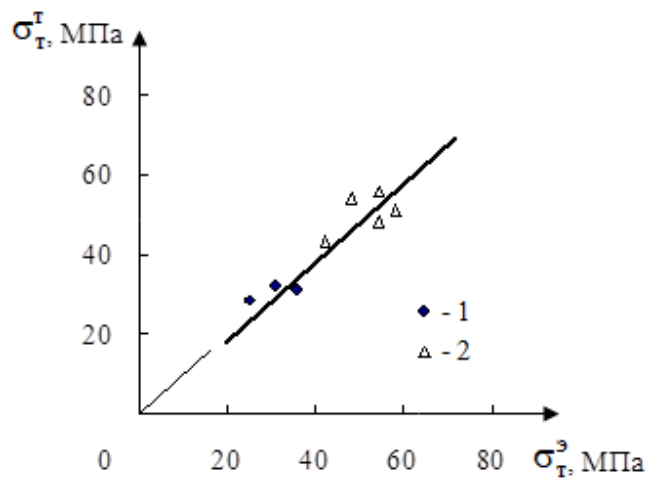
(7),

(3)

.4.

[4],

(5) (8).



.5.

(σ)

$\sigma = /2,3$

(1)

(2)

