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Methods of Modıfıcatıon of Used Polyolephınes

Shixaliyev Kerem Seyfi

Abstract: After aging, LDIP polyethylene was modified from local raw materials, and 80% of the original characteristics of LDIP polyethylene were restored. As a result of modification of the complex properties of LDIR by zeolite and midwife, enthusiasm is observed. It was determined that per 100 mass parts (wt.h) of LDIR leaving the operation when modified with a functional group - 15-20 wt.h., fillers - 6-8 wt.h. zeolite and 20-25 wt. including shell rock and to some extent it is possible to restore the basic properties of LDIR in certain optimal quantities.

Keywords: Low density polyethylene (LDIP), low density linear polyethylene(LDIP)Low density linear polyethylene (LDIP), recycled enamel, polymer, polyolefin (PO), polyethylene (PE), modification, raw material, tensile strength, static bending.

I. INTRODUCTİON

Every year he is keen on the production of polymer materials and these materials as a result of operation

lose their physical and mechanical characteristics and groans waste. This waste aggravates the environmental problem. As you know, polymer materials are not biodegradable for 300 years. Therefore, the recycling of polymer waste today is a very urgent problem. In order to utilize polymer waste, the most optimal way is modification.

Modification is the most reliable way to solve the problem of obtaining high-quality polymer materials and products from the used polyoliphenes (LDIP). The aim here is to screen functional groups and active centers by chemical and physicochemical methods and obtain homogeneous materials in accordance with the reproduction structure. [1-3]

II. METHOD

The initial and decommissioned LDIP properties are given in Tables 1 and 2.

Table 1 Properties of original and obsolete 10803-020 brand

№	Names of indicators	primary LDIP	It has been in operation for 3 months low density polyethylene	It has been in operation for 1 year LDP
1.	Density, kg / m3	895,0	880,0	9758,0
2.	Alloy flow rate, 1900C, load 2.16 kg, gr / 10 min	1,00	0,89	0,19
3.	Crystallization rate,%	39,0	-	-
4.	Tensile breaking stress, MPa	14,9	12,8	3,9
5.	Relative elongation,%	490	160	123
6.	Hardness, MPa	1,5	1,7	1,9
7.	>C=0 Number of groups	0,1	1,5	14,9
8.	The amount of insoluble phase , %	0	21,0	27,7
9.	Melting point, ^{0}C	107,4	113,0	120,2

Table 2 Physical and mechanical properties of LDIP (brand 16603-011)

№	Names of indicators	primary LDP	After 6 months of operation
1.	Density, kg / m3	899,0	-
2.	Polymer alloy flow rate, 1900C, load 2.16 kg, gr / 10 min	1,09	0,089
3.	Degree of crystallization	31-37	-
4.	Tensile tensile strength,MPa	8,9	-
5.	Fracture resistance. MPa	11,8	8,1
6.	Relative elongation,%	500	290
7.	Hardness, MPa	16-21	24
8.	Bending flexibility module, MPa	89	39

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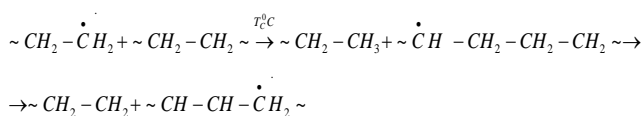*© Copyright: All rights reserved.*

Thermal and physical properties of LDIP are given in Table 3.

Table 3 Thermal physical properties of LDIP

№	Names of indicators	Indicators
1.	Melting point, ^{0}C	102-109
2.	Heat resistance according to Vika , ^{0}C	101-103
3.	Thermal conductivity, W / mK	0,29 -0,35
4.	Special heat capacity 20^0C- C / (kgK)	-8,9
5.	Coefficient of linear thermal expansion 0^0C- 100^0C, 1/^{0}C	(1,9-4,9) 10^{-4}
6.	Sitting during the casting process,%	,0-3,5
7.	Fragile temperature , ^{0}C	-100

The following changes occur in the structure of the LDIP during operation due to various factors.

As a result of thermal action, the molecular mass of LDIP changes and decreases as a result of the destruction of the macromolecule, and increases as a result of structuring. The direction of the destructive reaction is as follows. [4] The following changes occur in the structure of the LDIP during operation due to various factors.

$$\sim CH_2 - \overset{\bullet}{C} H_2 + \sim CH_2 - CH_2 \sim \overset{T^0_cC}{\rightarrow} CH_2 - CH_3 + \sim \overset{\bullet}{C} H - CH_2 - CH_2 - CH_2 \sim \rightarrow$$

$$\rightarrow \sim CH_2 - CH_2 + \sim CH - CH - \overset{\bullet}{C} H_2 \sim$$

Under the influence of high-energy rays (radiation) and ultraviolet rays, profound chemical transformations take place in polymers - destruction, construction of macromolecules, increase of unsaturation in macromolecules, etc.

If a technical carbon or mineral filler is added to the polymer under these conditions, the free radicals of the polymer can come into contact with the active centers of the filler particles and form a polymer-filler bond, which is the basis for the durability of the polymer mixture.

In real use, the polymer material is exposed to a combination of the above factors. Thermal oxidation destruction process also occurs under the influence of heat, oxygen, ozone and causes the polymer to decompose. The theoretical basis of the oxidation of polymers is based on the theory of chain reactions, and this process takes place according to the following scheme [7]

Analysis of the spectra of processed and used polyethylene by infrared spectroscopy shows that the oxygen-retaining groups correspond to the absorption band:> C = 0 1700 cm-1, and the absorption bands in the area of 3400-3600 cm-1 correspond to the displacement of - OH groups. Strong shifts in the IR spectrum of PE due to temperature occur in the crystalline phase in the absorption band-1894 cm-1 and in the amorphous phase in the absorption band in 2016 cm-1. Structural changes in the crystalline and amorphous phases when the polymer sample was oriented in different directions at 500C were confirmed by changes in the absorption bands in the area of 1600-2500 cm-1. Oxygen-containing functional groups Absorption in the area of 800-1250 cm-1

If a technical carbon or mineral filler is added to the polymer under these conditions, the free radicals of the polymer can come into contact with the active centers of the filler particles and form a polymer-filler bond, which is the basis of the stability of the polymer mixture. [8-9]

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cause the intensification of the bands. As a result of the analysis, it was shown that the destructive reaction does not occur from the methylene chain connection> C = 0, the onset of oxidation can occur in the groups near the branch, along with the oxygen-retaining groups. During oxidation, keto-, aldehydes, acids, ethers and anhydrides are formed

The analysis showed that the destructive reaction does not occur from the> C = 0 bond of the methylene chain, the onset of oxidation can occur in the oxygen-retaining groups as well as in the groups near the branch. During oxidation, keto-, aldehydes, acids, ethers and anhydrides are formed. This is due to the fact that air oxygen diffuses easily into polyolefins. The rate of diffusion depends on the thickness of the product. The amount of oxygen absorbed during the oxidation of LDIP at 1000C for 1000 hours, the thickness of the sample - 0.05; 0.25; At 0.65 μm, it is 220, 180 and 160 ml / g, respectively. The most important factor influencing the rate of oxidation is temperature. As the temperature drops from 80 to 140 ° C, the oxidation resistance of ASPE decreases from 130 hours to 2 hours. As the temperature increases, the rate of oxygen uptake increases significantly and the persistence of LDIP deteriorates. The tensile strength of ASPE decreases from 125 MPa to zero when the temperature increases from 20 to 100 0C, and the relative elongation decreases from 540-600% to 115%.

The temperature dependence of the destructive voltage change is due to the following mechanism (Table 4):

Table .4 Destructive voltage fluctuations depending on temperature

№	Destructive tension MPa	Temperature , ^{0} C			
		22	41	58	7
1	In compression	131	79	6	-
2	In static bending	120	87	61	-
3	At the cut	156	127	91	5

The relative elongation at break of such material is 210%, the fluidity of the alloy is 0.1-0.3 g / 10 min. contane. The build-up limit is reduced by an increase in temperature and an increase in turnaround time as a result of the parallel destructive reaction. This allows you to adjust the physical- mechanical and technological characteristics of the modified material, as well as the construction limit.

III.   RESULTS

Table 5 LDIP and Low density linear polyethylene film with extrusion obtained before and after aging

Indicators	LDP		LDIP
	before	Then	extrusion made
C-O amount of group, mol	0,1	1,5	1,5
Amount of low molecular weight unds,%	0,1	52	5,2
Bride amount,%	0	18	1,9
, Destructive tension in the groin	15,5	11,9	10
Relative elongation at break,%	500	18	129
Crack resistance, clock	7	-	1
Resistance to light, day	91	-	52

After fixing with obsolete LDP and LDIP fillers, their fixative-mechanical properties were determined and the results obtained are given in Table 6 .

Table 6 Influence of LDP on physical and mechanical properties

Sıra №	Indicators	Kompozisiyaların tərkibləri və xassələrinin göstəriciləri		
		LDP 1 year from exposure then	LDIP compositions based on (1) and properties names (2)	LDIP composition based on the binder ED-20 added İ P
1.1.	Functionally group polymer (According to 100m.f. of LDIP), mass fraction.	-	-	15,0
1.2	Filler-zeolite, m.f.	-	8,0	8,0
1.3	Disperse-stearic acid,M.F	-	2,0	2,0
2.1	Tensile flow rate, MPa	7,1	4,8	8,2
2.2	Tensile breaking stress, MPa	4,6	11,8	14,8
2.3	Relative elongation at traction,%	115	100,0	150
2.4	Alloy flow rate - AFR, gr / 10 min	0,22	0,15	0,52
2.5	Relaxation module, $,25^0C,\varepsilon=20\%,$MPa	2,7	2,8	2,2
2.6	Elasticity modulus, MPa	80,2	72,8	70,0
2.7	Effective viscosity -$\eta_{\varepsilon,}$ 160^0C, Pa·min	12,2	13,8	10,1

Table 7 Thermal resistance of A change in temperature from 20 to 80 ° C leads to a 2-3-fold decrease in the durability of A change in temperature from 20 to 80 ° C leads to a 2-3-fold decrease in the durability of LDP. (Table 7)

Table 7 Physical and mechanical properties of used and modified LDP compositions depending on the amount of cuttings

Queue №	Composition of compositions, m.f.	Decomposition activation energy - activation energy, kC / mol	Half-life t ½, min.	Decomposition start temperature- T d.b., ^{0}C
1.	Initial LDP -100	64,4	40,5	147,8
2.	It has been in operation LDP -100	67,1	66,1	149,2
3.	LDP + cuttings-100+2	78,2	65,6	1981
4.	LDP + cuttings-100+4	86,2	71,4	227,4
5.	LDP + cuttings- 100+6	111,5	76,5	235,2
6.	LDP + cuttings--100+8	121,9	82,4	257,1

Table 8 Thermal resistance of LDİP compositions depending on the amount of cuttings

Queue №	Composition of compositions, m.f.	Decomposition activation energy - activation energy, kC / mol	Half-life t ½, min.	Decomposition start temperature- T d.b., ^{0}C -
1.	Initial LDİP -100	63,2	36,3	140,9
2.	It has been in operation LDİ P -100	71,1	68,9	148,2
3.	LDİ P+ cuttings--100+2	74,7	67,6	189,2
4.	LDİP + cuttings--100+4	86,2	72,1	228,4
5.	LDİP + cuttings---100+6	109,5	75,9	236,2
6.	LDİP + cuttings---100+8	124,3	81,9	258,1

A change in temperature from 20 to 80 ° C leads to a 2-3-fold decrease in the durability of LDP (Table 9)

Table 9 Physical and mechanical properties of used and modified

№	Indicators	primary LDP	It has been in operation d	Modified LDP				
				1	2	3	4	5
1.	Polymer alloy flow rate ,190°C, load 2,16 kq.qr/10min	1,1	0,075	0,4	0,4	0,3	0,18	0,12
2.	Fracture resistance, MPa	12,2	7,7	8,1	8,4	9,6	10,3	10,7
3.	Relative elongation,%	600	260	340	340	320	300	290
4.	Hardness, MPa	18	25	20	20	22	22	23
5.	Bending flexibility module, MPa	98	42	70	71	68	65	60
6.	Heat resistance according to Vika ,°C	105	-	105	107	110	118	120

IV. CONCLUSİONS

In order to convert thermlast waste into raw materials, it must be pre-sorted and then processed. The processing of thermlast waste depends on the extent to which it loses its original properties. Currently, there are many unresolved issues for the recycling of LDP virtually any waste of polyethylene can be recycled. This article reflects the results of modification of low-density polyethylene waste with functional groups, which is considered to be the most convenient method of processing.

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