

CHEMICAL STRUCTURE CHARACTERISTICS OF RECYCLED POLYETHYLENE

Aliyeva Zahida Nazim¹, Djafarova Dursadaf Nariman²

^{1,2}Azerbaijan State Oil and Industry University, Baku, Azerbaijan

¹ email.zahidaaliyeva69@gmail.com, <http://orcid.org/0000-0002-6420-1480>

² ceferova.dursedef@gmail.com, <http://orcid.org/0000-0002-2758-2421>

ABSTRACT

His study examined the aging process of polyethylene used in the spring-summer season in the Absheron Valley for 6 months and studied their recycling. It has been established that the technological and physical-mechanical properties of the processed polymer change significantly depending on the operating conditions and the intensity of the factors affecting it. As a result of our modification, it was possible to restore 80% of the original properties of polyethylene, which after decommissioning turned into waste.

Keywords: Low density polyethylene (LDPE). recycling of polymer waste, modification, ecology.

Introduction

Very year, the number of polymer products used in everyday life in our republic is constantly increasing, and these products, after use, become waste and cause environmental damage to our flora and fauna [1-4].

Low-density polyethylene (LDPE) is often widely used as a raw material in the production of any plastic materials. Packaging materials made from them can be used both in everyday life and in industry. They are then sent for recycling, regardless of their use [5-7].

While everything is clear with the processing of household polyethylene, the industry faces a number of difficulties when processing polyethylene [8-11]. Typically, polyethylene, for example, as a packaging material, unlike household materials, is used for a long time, and during operation, in addition to natural exposure (direct sunlight, temperature changes), it is covered with a net, which is impossible to get rid of it completely even after thorough cleaning [12]. Therefore, the raw materials obtained as a result of processing polyethylene used in industry do not have quality indicators. A study of literary materials has shown that the recycling of polyethylene and materials based on them has not been sufficiently studied. Hereford, research in this area is very relevant [13-14].

Method

In this work, we used polyethylene waste, which was in operation in various zones of Azerbaijan. Under these climatic conditions, processes of destruction and structuring of polyethylene macromolecules occur at different rates. In the first case, low-molecular compounds are formed, and in the second, an insoluble gel fraction is formed. However, the amount of gel should always be considered so that different processing methods can be selected. In this work we used LDPE and LLDPE films before and after aging. Table 1 shows the characteristics of LDPE

and LLDPE films before and after aging.

Table 1. Low density polyethylene (LDPE) characteristics before and after aging

Indicators	Before	LDPE	
	operation LDPE	after exploitation	
The amount of C-O group, mol	0,1	1,6	1,6
Amount of low molecular weight compounds, %	0,1	6,2	6,2
Amount of gel fractions, %	0	20	2,0
Destructive stress in crushing, Mpa	15,5	11,9	10
Relative elongation at break, %	490	17	125
Resistance to cracking, hours	8	-	1
Fastness to light, day	90	-	50

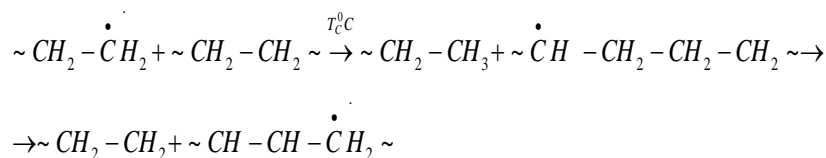
Studies have shown that the strength of a polymer material quickly decreases when recycled more than 3-5 times. When processing LLDPE, it is necessary to increase the casting temperature by 3-5% to disperse the gel fraction. When processing waste polyethylenes, it is necessary to modify them so that the physical and mechanical properties of the product obtained as a result of processing are high and the product does not deteriorate quickly. during operation and is suitable for long-term use.

Result

Methods for processing polyethylene waste

Methods for recycling polyethylene waste depend on its type. Studies have shown that the strength of a polymer material quickly decreases when processed more than 3-5 times. When processing LLDPE, it is necessary to increase the casting temperature by 3-5% to disperse the gel fraction. When processing waste polyethylene, it is necessary to modify them so that the physical and mechanical properties of the product obtained as a result of processing are high and the product does not deteriorate quickly. during operation and is suitable for long-term use

As a result of thermal exposure, the molecular weight of PE decreases as a result of the destruction and splitting of the macromolecule and increases as a result of structuring. The direction of the destruction reaction is as follows



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

Infrared spectroscopic analysis of processed and used polyethylene shows that the absorption band at 1700 cm^{-1} corresponds to oxygen-containing groups: $>\text{C}=\text{O}$, and the absorption bands in the region of $3400\text{-}3600 \text{ cm}^{-1}$ correspond to the displacement of hydroxyl

recycled vary significantly depending on the operating conditions and the intensity of the factors affecting it. In the recycling process, the polymer is once again subjected to mechanical-chemical, thermal, and oxidizing effects. Depending on the number of recycling, the influence of the factors is strengthened.

Conclusion

The study of the effect of the number of recycling on the properties of products obtained from waste showed that recycling 3-5 times has little effect on the change in the properties of the polymer, even a noticeable decrease in mechanical durability compared to the first recycling begins only after 5-10 recycling.

In the recycling process of LDPE products, it is advisable to increase the temperature by 3-5% in the casting operation or by 4-6% in the speed of the screw axis (auger) during extrusion. The selection of such processing parameters leads to the disintegration of the gel fraction during processing.

During the recycling process, under the influence of air oxygen, the molecular mass of polyolefins decreases and the fragility of the processed polymer significantly increases.

In the process of recycling PP from the class of polyolefins, the flow rate of the polymer alloy increases, but the durability indicators of the polymer change partially. Therefore, in many cases, products based on decommissioned PP are processed but also used in mixtures with primary polymer.

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ISTISMARDAN ÇIXMIŞ POLİETİLENİN KİMYƏVİ QURULUŞUNUN XÜSUSİYYƏTLƏRİ

Əliyeva Zahidə Nazim¹, Cəfərova Dürsədəf Nəriman²

^{1,2} Azərbaycan Dövlət Neft və Sənaye Universiteti, Bakı, Azərbaycan

¹ zahidaaliyeva69@gmail.com, <http://orcid.org/0000-0002-6420-1480>

² ceferova.dursedef@gmail.com, <http://orcid.org/0000-0002-2758-2421>

XÜLASƏ

Tədqiqatda Abşeron vadisində yaz-yay mövsümündə istifadə olunan polietilenin 6 ay müddətində qocalma prosesi öyrənilib və onun təkrar emalı tədqiq edilmişdir. Müəyyən edilmişdir ki, emal edilmiş polimerin texnoloji və fiziki-mexaniki xassələri iş şəraitindən və ona təsir edən amillərin intensivliyindən asılı olaraq əhəmiyyətli dərəcədə dəyişir. Bizim tərəfimizdən həyata keçirilən modifikasiya nəticəsində istismardan çıxarıldıqdan sonra tullantıya çevrilən polietilenin ilkin xassələrin 80%-ni bərpa etmək mümkün olmuşdur.

Açar sözlər: Aşağı sıxlıqlı polietilen (ASPE). polimer tullantılarının təkrar emalı, modifikasiyası, ekologiyası.

ХИМИЧЕСКАЯ СТРУКТУРНАЯ ХАРАКТЕРИСТИКА ВТОРИЧНОГО ПОЛИЭТИЛЕНА

Алиева Захида Назим¹, Джафарова Дурсадаф Нариман²

^{1,2} Азербайджанский Государственный Университет Нефти и Промышленности, Баку, Азербайджан

¹ zahidaaliyeva69@gmail.com, <http://orcid.org/0000-0002-6420-1480>

² ceferova.dursedef@gmail.com, <http://orcid.org/0000-0002-2758-2421>

РЕЗЮМЕ

В представленном статье дана информация о старения полиэтиленов в течение 6 месяцев используемых в весенне-летний сезон в долине Абшерона, и изучалась их переработка. Установлено, что технологические и физико-механические свойства перерабатываемого полимера существенно изменяются в зависимости от условий использования и интенсивности воздействующих на него факторов. В результате нашей модификации удалось восстановить 80% первоначальных свойств полиэтилен, который после вывода из эксплуатации становится отходом.

Ключевые слова: Полиэтилен низкого давления (ПЭНД), переработка, модификация, экология полимерных отходов.