SUBSTANCES INCREASING THERMAL STABILITY OF THE POLYMER

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ABSTRACT

Selling services and maximizing profit is an important goal in any manufacturing industry operating under market conditions. The chemical industry is an expansion of production service areas, increasing profits as a result of occupying the market. As a means of achieving this goal, it is important to produce affordable, competitive products using cheap local raw materials.

Keywords: *polyethylene, stabilizer, composite, stearin acid, irgonox, santanox, gossypol tar.*

АННОТАЦИЯ

Продажа услуг и максимизация прибыли – важная цель любой производственной отрасли, работающей в рыночных условиях. Химическая промышленность – это расширение производственных зон обслуживания, увеличение прибыли в результате занятия рынка. В качестве средства достижения этой цели важно производить доступную, конкурентоспособную продукцию с использованием дешевого местного сырья.

Ключевые слова: *полиэтилен, стабилизатор, композит, стеариновая кислота, иргонокс, сантанокс, госсиполовая смола.*

INTRODUCTION

President Sh.M. Mirziyoyev spoke about new innovative projects and ways to modernize production. Selling services and maximizing profit is an important goal in any manufacturing industry operating under market conditions.

Composite polymer materials, including polyethylene composites, contain various thermal stabilizers or, in other words, thermostabilizers. Because polyethylene, like other polymers, undergoes thermal destruction after a certain temperature [2]. To prevent this and give the product the desired properties, thermal stabilizers and other additives are added to it. In order to increase the thermal stability of the polyethylene composition, the following substances are used: Santanox and Irganox-1010 and many similar substances. When they are part of polyethylene, they bind gases released at high temperature, absorb them and prevent destruction. Some of the thermal stabilizers added to the composition of polyethylene-based composite polymer materials, along with increasing thermal stability, help reduce intermolecular

frictional forces by lubricating other additives in the composition with the main polymer. There are substances that help to reduce the internal and external frictional forces in the composition preparation process for better mixing of the components. These include lubricant K-11 and mycol stearic acid. The current shortage and high cost of thermal stabilizers and their import from abroad imposes the obligation to create local thermal stabilizers. Currently, many scientific works are being carried out on the creation of new types of thermal stabilizers based on local raw materials and industrial waste [3].

DISCUSSION AND RESULTS

In this work, to increase the thermal stability of polyethylene, instead of thermostabilizers such as Santanox and Irganox-1010, gossypol tar, a technological waste of a local oil-oil extraction plant, was used.

To increase the thermal stability of polyethylene, a working recipe with the following content was developed with gossypol resin:

№	Names of components	Quantities of components, %	
		Standard recipe	Recommended recipe
1	Polyethylene raw materials	96,36	96,36
2	Irgonoks-1010	2,64	-
3	Santanoks	1,0	-
6	Gossypol tar	-	3,64
	Total:	100	100

During the processing and use of plastics, including polyethylene, various physical and chemical phenomena occur as a result of the influence of heat, light, oxygen in the air, chemical reagents, mechanical forces, microorganisms and other factors. The physical and physico-chemical properties of polyethylene deteriorate as a result of possible reactions during polymer processing. This process often occurs due to the reduction of the molecular mass due to the breaking of the main bonds in the polymer macromolecules. The breakdown of macromolecules under the influence of various physical and chemical agents is called destruction. As a result of destruction, the molecular mass of the polymer decreases, its chemical structure, physical and mechanical properties change. [4].

During the processing and use of polymers, when changing their properties by chemical and physical methods, the occurrence of the destruction process leads to negative consequences. Chemical destruction is caused by reagents (water, acid,

alkali, salt, oxygen, etc.), and physical destruction is caused by physical effects (heat, light, mechanical energy, various rays, etc.) [3].

Physico-chemical methods, spectroscopic, gas chromatographic, differential thermal analysis, mass spectroscopic and other methods are used in the inspection of destructive processes [4].

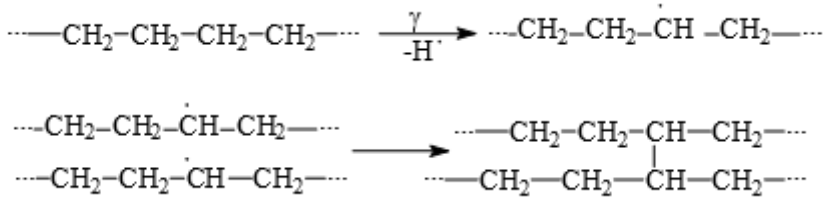
The resistance of polymers to oxidizing substances depends on the presence or absence of easily oxidizable groups. Oxidative destruction is significantly accelerated under the influence of ultraviolet (UV) light, radiation, heat, oxygen, strong oxidants (ozone, HNO3, KMnO4) and metals (Fe, Cu, Mn) [5].

Monitoring of the thermal destruction process is often carried out by heating in an inert gas atmosphere or in a vacuum. The characteristics of thermal destruction are that it not only reduces the degree of polymerization of the macromolecule, but also leads to its structural change and depolymerization. The formation of the monomer depends on the destruction process and the synthesis method of the polymer, the nature of the macromolecule [6].

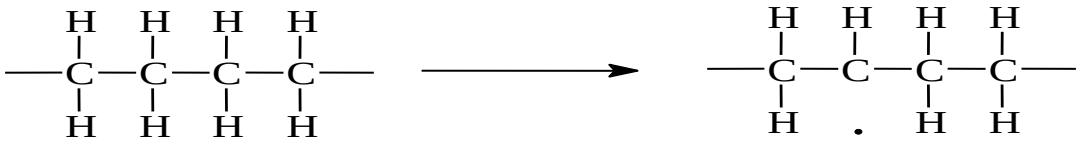
The formation of free radicals and macroradicals as a result of the destruction of macromolecules under the influence of rays with different wavelengths leads to changes in molecular mass, solubility and other properties.

When the light is absorbed, the chemical bonds of the macromolecule are broken and free radicals are formed. As a result of injection, the molecular mass, structure and properties of the macromolecule change.

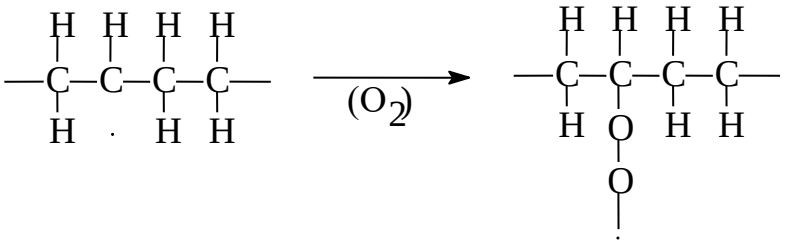
Destruction of polymers under the influence of radioactive rays. Under the influence of radioactive rays, free radicals can be formed on the surface of the polymer, due to this free radical, the chains can be cross-linked, destroyed and oxidized. For example, the oxidation reaction in polyethylene goes as follows:



In the production of the product, polyethylene is heated and transferred to a liquid state, in this state it is given a shape under the influence of mechanical energy, which is carried out in the external environment (under the influence of air, oxygen and gases). Part of the supplied energy is used to break the chemical bonds in the polyethylene macromolecule, which leads to a change in the molecular mass [7].



The formed free radical is unstable and immediately combines with an oxygen molecule to form a peroxide radical[8].



The resulting peroxide radical is unstable and takes a hydrogen atom from another polyethylene molecule. Thus, the oxidation reaction of polyethylene turns into a chain reaction [9].

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