STABILIZATION OF POLYETHYLENES F-0220S, PY-342, I-1561 WITH ANTIOXIDANT STABILIZER AO-1

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Abstract. *Synthesized stabilizer antioxidant AO-1 was mixed with F-0220S, PY-342, I-1561 polyethylene products of low density, high, medium and low pressure by CLAWSON method and processed in "Jinan Himax LSB" extruder. Adding AO-1 stabilizer-antioxidant to polyethylene, it was checked based on GOST 11262-2017 and compared with GOST requirements.*

Keywords: *stabilizer-antioxidant, nairit KR-50 chloroprene, polychloroprene, fiber, polyethylene, gossypol, phenoxyl radical, ethylenediamine.*

Introduction. Today, scientific and practical research is being conducted around the world to develop technology for producing antioxidant stabilizers that meet all requirements and standards, based on organic and inorganic compounds for polymers. In this direction, obtain elemental-organic additives containing metal, as well as develop the production of polymer products, stabilize polymer materials, synthesize and use antioxidant stabilizers with high efficiency in the national economy, everyday life and industry, as well as improving existing technologies, special attention is paid to this.

Stabilization of the polyolefin solution with antioxidants such as sterically hindered phenols is used to prevent degradation processes of the chemical composition of PE during processing [1; 231-240-b, 2; pp. 7-9]. In addition, the mechanism of their action was described by N.N. It can be explained using the theory of chain-branching and degenerative branching reactions by Semenova. N.M. Emanuel and G.E. More developed in the works of Zaikova [3; pp. 24-26, 4; pp. 153-164]. In particular, the general scheme of oxidative destruction of polymers in the presence of chain antioxidants at medium temperature (RH) [5; 133-136-p, 6; 53-56-b, 7; pp. 40-42, 8; 27-29 p].

It is known that the activity of phenolic antioxidants depends on their chemical structure. Thus, the presence of various substituents in the 3, 4 and 5 positions (for example, aliphatic groups) in the nucleus leads to an increase in its activity. In our case, azomethinephenylmelamines synthesized during oxidation processes can be converted into corresponding phenoxyl radicals, which helps to increase the antioxidant activity and inhibit the processes of destruction of the polymer material [9; p. 1294-11297, 10; pp. 7-28, 11; p. 60-63, 12; pp. 406-411].

The thermal oxidative degradation of Nairit KR-50 chloroprene rubber was studied in the presence of the condensation product of gossypol resin with ammonia (GSA), the condensation product of gossypol resin with ethylenediamine (GSEDA). It was obtained by condensation of gossypol resin with m-phenylenediamine (GSFDA), which was not previously used as a heat stabilizer. Kinetics of thermal-oxidative destruction of Nairit KP-50 and its stabilized samples was studied using the differential thermogravimetric method [13].

Among the studied stabilizers, GSFDA turned out to be the most effective, which was found to have a much higher inhibitory effect compared to the amine-type stabilizer "Neozon D" in the industry [14; pp. 3-5].

Special additives of various chemical compounds, such as mono- or polyatomic phenols, metal salts of carboxylic acids, containing nitrogen-phosphorus and sulfur, are used to stabilize polymers containing halogens (PVC, PVF, polychloroprene, sulfochlorine polyethylene, etc.) organic compounds are used [15; 945-951-b].

The main part. AO-1 brand stabilizer-antioxidant was mixed with F-0220S, PY-342, I-1561 linear polyethylene products of low, medium and high density using the CLAWSON method and processed in the "Jinan Himax LSB" extruder.

Jinan Himax LSB Extruder Working Zones, Processing Mechanism: It consists of a filera and 2 zones, and the process was carried out with the following heat indicators.

Table 1

Indicators of the extruder during the test process

Polyethylene brand	Filera, °C	Zone 1, °C	Zone 2, °C
F-0220s	265-270	205-210	210-215
P-Y342	275-280	215-220	220-225
I-1561	240-245	190-200	200-205

The synthesized AO-1 brand stabilizer-antioxidant used for the test was added to polyethylene, checked on the basis of GOST 11262-2017 and compared with GOST requirements, the obtained results are presented in Table 2 below.

Addition of low amounts (1.0-1.5-3.0%) to polyethylene fluidization improved flowability, impact strength, elongation at break, and tensile strength of polyethylene, and the effect on strength was reversed.

Table 2

Physico-mechanical properties of polyethylene modified with different amounts of AO-1.

Samples	Tensile strength, H	Stretching, мм	Tensile strength limit σ_p, Н/мм^2	Modulus of elasticity, Н/мм^2
Basic PE				
PE +0.5% *AO-1*	759,637	665	37,98	213,754
PE +1.5% *AO-1*	623,977	640	31,19	274,544
PE +3.0% *AO-1*	655,807	550	32,79	267,998

Based on these test experiments, it was observed that when the synthesized stabilizer antioxidants were added to polyethylene, its physico-mechanical properties shifted towards a positive indicator. Based on the results of the analysis and the economic efficiency of this additive, the management of "Shurtan Gas Chemical Complex" Limited Liability Company recommends the use of this AO-1 stabilizer-antioxidant for stabilization of polymeric materials. At the same time, at the current stage of the development of scientific works and practical developments in the field, it is believed that the use of stabilizers is effective and that the new oligomer stabilizer has wide prospects in terms of the production of antioxidants.

Summary

Based on the above results, AO-1 brand stabilizer antioxidant, low-density fluidity, high, medium and low-pressure, compatibility with F-0220S, PY-342, I-1561 brand polyethylene products and good mixing, polyethylene content methyl (-CH_3), methylene (-CH_2) and the presence of homologues of phenol is evidence of improved physical and chemical properties of polyethylene.

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