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Environmental Impact of Polymer Waste and its Recycling

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Annotation: Polymer waste causes great harm to the environment, as it does not decompose for a long time, polluting the soil, water and air. Plastic and other polymer materials undergo a slow biodegradation process, as a result of which they have a negative impact on ecosystems. Therefore, recycling processes are of great importance to solve the problems associated with polymer waste. Polymer recycling allows for the efficient use of their hidden resources and the protection of the environment.

Key words: Polymer, human, nature, substance, polyethylene, global, oxide, history, Asia, state, information, product, disease, package, plastic.

Introduction:

Polymer waste has a serious impact on the environment, as polymers are often materials that resist biodegradation and persist in nature for many years. Polymers, especially plastics, do not decompose quickly in water or other natural conditions, which leads to their easy accumulation. This accumulation poses a threat to the ecosystem, as animals can ingest polymer waste, which can harm their lives. Here are some polymers: Polyethylene [-CH_2-CH_2-] - a chain polymer. Colorless, translucent substance. Liquidation temperature, depending on the method of production, 105-130 ° C, density 920-970 kg / m^3 [1]. It has high elasticity and tensile strength, is resistant to alkalis, chlorides, sulfates, fluorides and organic acids, and is physiologically harmless. Polyethylene is one of the cheapest polymers, which ranks first in the world in the production of thermoplastics. In industry, it is obtained in 3 different ways: polymerizing ethylene at high pressure (1200-1500), at medium pressure (30-40) and at low pressure (1-7 at). It is used in the production of electrical insulating coatings, films, materials for protection against corrosive environments, unbreakable containers and other things. [2]

The history of plastic bags. The first ban on plastic bags was introduced by Bangladesh in 2002. In this country, plastic bags clogged the city's drainage system, causing flooding and killing thousands of people.

The problem of plastic bags: what is the attitude to this issue in Central Asian countries?

Kazakhstan: plans to introduce separate waste collection. Like Uzbekistan, Astana initially planned to abandon the free distribution of polyethylene products and then completely eliminate its production [2,3]. However, environmentalists consider such an initiative pointless. "Polyethylene has many advantages, which is why people do not give it up. It is only necessary to collect polyethylene. Therefore, the Kazakh government is now introducing separate waste collection," Sputnik Kazakhstan reports. Astana has already begun installing yellow bins for plastic, glass and paper waste.

Kyrgyzstan: wants to abandon plastic bottles. The Kyrgyz government is proposing to ban the use of plastic bags and plastic bottles in the republic. This is provided for in the Cabinet of Ministers' resolution on the prohibition of the import, production and use of plastic bags and plastic bottles in the "Hot" Lake Biosphere Reserve. The initiator of the document is Ekmat Baybakpayev, a deputy of the

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Jokorgu Kenesh. The deputy proposed that when this law is adopted, criminal, administrative, correctional and material liability measures be introduced in case of violation of the law.

Tajikistan: It is proposed to abandon polyethylene in everyday life. According to Tajik media, representatives of the country's environmental protection agencies are proposing to abandon the use of polyethylene bags in everyday life. Currently, Tajikistan is facing the problem of pollution of nature with plastic waste, and the Committee for Environmental Protection under the Government of the republic is proposing to gradually adopt measures to abandon the use of single-use plastic bags [5]. For example, it is proposed to switch to paper and textile bags instead of plastic bags. Also, plastic waste recycling plants have been launched in the republic. Sputnik reported that the Khujand Regional Sanitary and Epidemiological Surveillance Center of Tajikistan recently banned the use of plastic containers in public catering establishments. Of these, polyethylene is the most widely produced in the world. Until recently, it was thought that only metal parts could be used to make machine parts, but now it has become clear that all of their parts can be made from solid grades of polyethylene. What is most interesting is that some parts of the human body and bones can be made from polyethylene. So polyethylene has entered the human body from the outside world . Perhaps it is not surprising that in a few years scientists will be able to create living tissues from polyethylene. Polyethylene was the first radar material in England during World War II, and at first it was more valuable than gold. Now it is much cheaper than other polymers. There is always a great demand for products made from it. Therefore, the production of polyethylene is economically profitable [5]. Currently, three types of polyethylene (PE) are produced worldwide: high-density PE, low-density PE and linear low-density PE. There are dozens of varieties of each. The properties of polymers differ slightly depending on the catalysts used and the comonomers in the chain, and the field of application varies accordingly. It is known from the literature that the following syntheses can be carried out to obtain PE: 1) By polymerization of ethylene: nC2H4-CH3-CH2-(C2H4)n- 2- CH=CH2 2) From diazomethane nCH2N2→CH3-CH2(CH2)n-2-CH=CH2+nN2 3) From hydrogen and carbon (II) oxide NCO+2nH2→CH2-CH2-(CH2)n-4-CH=CH2+nH2O In industry, PE is produced only by the first method, since the cost of the resulting product is low and the quality is high. Reactions 2-3 were carried out in laboratory conditions as a research study to determine the relationship between the physical properties of high-molecular paraffins and their chemical structure. A relatively low-molecular polymer of ethylene was obtained by the Russian scientist Gustavson in 1884, which was in a liquid state. After Gustavson's experiments, efforts were made to obtain high-molecular PE for another 50 years[6]. Since they could be used as synthetic lubricants, they were produced on an industrial scale in Germany during World War II.

Figure 1. Residual ultra-porous basalt aggregate (BV) and recycled PET: a) Fractions of mechanically crushed aggregate and PET particles; b) Detail of the coarse fraction of the aggregate (10-20 mm).

In 1933-1936, English researchers Fawcett and Gibson and Soviet scientist AIDintses , without knowing each other, managed to obtain a high molecular weight solid polymer at 1000 atm. pressure, 2000 C temperature and adding a small amount of oxygen as a catalyst. The first industrial production of PE was carried out in England in 1937. In 1938, an underwater cable was made from PE, in 1944, PE called "alkaten" was produced in England, and a short time later, an experimental device with a tubular reactor for obtaining PE by this method was put into operation in Germany. In 1943, PE began to be obtained in the USA at high pressure (1200 atm.) and 2000 C temperature. Ethylene was first obtained by the dehydration reaction of ethyl alcohol, and later it was switched to petroleum refining gases. By the end of 1955, the number of high-pressure PE production plants in the United States had increased [6]. As PE was studied, its many advantages were discovered, and its production volume began to increase. PE began to be successfully used not only in the cable industry, but also in the chemical industry, water supply and irrigation systems, construction, agriculture and household as flexible coating films for corrosion resistance. Polymerization is a reaction in which low-molecular compounds containing double bonds are combined with each other to form compounds with a large molecular weight. These substances decompose into radicals when heated: Benzoyl peroxide Azobisisomic acid dinitrile (DAK) Chain growth occurs as a result of the sequential addition of radicals formed by the initiator to monomer molecules: As a result of chain rupture, active radicals disappear, and the growth of kinetic and material chains stops. In radical polymerization, chain termination occurs mainly through two mechanisms - recombination or disproportionation.

Conclusion:

Although polymer products are widely used in various areas of human life, their impact on the natural environment poses serious problems. Polymers do not decompose for a long time and accumulate in nature, disrupting the biological chain, negatively affecting animals and ecosystems. Also, plastics, especially microplastics, can accumulate in water sources and soil, harming human and animal health.

However, research is ongoing into recycling polymers and accelerating their biodegradation.

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