

TYPES AND IMPORTANCE OF SECONDARY RAW MATERIALS FROM POLYMER WASTE

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Annotation

This article discusses the polymer product, its types, types of waste and their processing. Among the wastes, the most common waste in recent times is polymer products. It is possible to obtain secondary raw materials as a result of processing of polymer products. The use of secondary raw materials in various industries is much cheaper than primary raw materials. More than 50% of polymer products have recently been recycled.

Keywords:

Polymer, waste, secondary raw materials, hydrolysis, pyrolysis, catalyst

Today, with the rapid growth of production and the development of industry, the problem of waste is becoming one of the most pressing issues in the world. Today, such wastes are the product of human and technological advances [1].

Waste is divided into several types. For example: food scraps, various papers (newspapers, cartons, boxes, etc.), wood and wood products, ferrous and non-ferrous metal materials (fittings, steel cans, car batteries, foils, cans, aluminum containers, batteries etc.), construction waste (concrete, brick, stone, etc.), various rubber and rubber products (tires, shoes), polymeric materials (plastic containers, plastic pipes, hoses, polyethylene bags, films) etc.), glass and glassware. All of this is now referred to as household waste [2].

According to experts, household waste is one of the cheapest raw materials in the world. The experience of developed countries shows that 85% of waste can be recycled. In some countries, a separate waste collection system has been established. As a result, most of the raw materials, such as paper, plastic, aluminum, are sent for recycling. The positive impact of this process on the environment is enormous. Recycling significantly saves energy and raw materials.

In view of the above points, we are mainly conducting research on polymer waste and secondary raw materials from them. This is due to the fact that a large amount of the above-mentioned wastes are made of polymeric materials.

Polymers (Greek *polimeres* - many parts) - molecules (macromolecules) are composed of chemical compounds of high molecular weight (several thousand to several million) consisting of one or more different multiple groups (monomer links).

Polymers are chemical products composed of high molecular weight, long-chain polymers. At the current stage of development, polymer production is growing at an average of 10 ... 12% per year and is projected to reach 250 million tons by 2010. Their per capita consumption in industrialized countries has doubled in the last 20 years and is 85 ... 90 kg. reached. By the end of the decade, this figure is projected to increase by 45 ... 50% [3].

In addition, according to some sources, 20,000 plastic bottles are produced every second. This means that millions of plastic containers are purchased every minute. All purchased containers in 2016 alone - 480 billion units.

One of the reasons for the rapid development of polymer products is their convenience in packaging. Therefore, 41% of all plastics produced are used in packaging. This is due to convenience and safety, low

prices and high aesthetics - these are the defining conditions for the rapid growth of the use of plastics in the production of packaging. Such popularity of polymers is explained by their lightness, efficiency and a set of valuable service properties. Polymers are serious competitors for metals, glass and ceramics. For example, glass bottles require 21% more energy than plastic bottles.

There are more than 150 types of plastics, 30% of which are mixed with various polymers. During the processing of polymers, more than 20 chemical additives are added to achieve certain properties, and as a result they become harmful and toxic material [4,5].

The main way to obtain secondary raw materials from polymer waste is to dispose of them, i.e. to reuse them. As a result, capital and operating costs do not increase, and in some cases are even lower than the cost of their destruction.

The positive side of recycling is that additional amounts of useful products are obtained for various sectors of the economy and re-pollution of the environment is prevented. For these reasons, recycling is not only an economically viable solution, but also an environmentally friendly solution to the problem of plastic waste utilization.

As we have learned in the sources, in countries such as America, Germany, China, more than 50% of the waste is recycled. We also achieve the desired results if we increase the percentage of waste utilization as a secondary raw material. Today, only a small fraction (only a few percent) of the polymer waste produced each year is recycled. This is due to difficulties with pre-treatment of waste (collection, sorting, separation, cleaning, etc.), lack of special equipment for recycling and other factors.

The process of obtaining or processing secondary raw materials consists of several stages.

Pyrolysis is the thermal decomposition of organic products with or without oxygen. Pyrolysis of polymer waste allows to obtain high-calorie fuels, raw materials and semi-finished products used in various technological processes, as well as monomers used for polymer synthesis.

Gaseous products in the thermal decomposition of plastics can be used as fuel to obtain working water vapor. Liquid products are used to produce heat carriers.

The scope of application of solid (waxy) pyrolysis products of plastic waste is very wide (components of various protective compositions, lubricants, emulsions, impregnating materials, etc.).

Catalytic hydrocracking processes have also been developed to convert polymer waste into gasoline and fuel oils.

Many polymers can be broken down again into starting materials as a result of reaction reversibility. Methods of separation of PET, polyamides (PA) and foamed polyurethanes are important for practical use. Decomposition products are again used as raw materials for the polycondensation process or as additives to the primary material. However, the compounds present in these products often do not allow the production of high quality polymer products, such as fibers, but their purity is sufficient for the production of molding masses, low-solubility and soluble adhesives.

Hydrolysis is the reverse reaction of polycondensation. With its help, at the point where it is combined with the components of water, the polycondensates are destroyed to the original compounds. Hydrolysis occurs under the influence of high temperatures and pressures. The depth of the reaction depends on the (pn) value of the medium and the catalysts used.

This method of using waste is more energy efficient than pyrolysis because high quality chemical products are recycled.

Another method economical compared to hydrolysis for the separation of polymer wastes is glycolysis. Destruction occurs at high temperatures and pressures in the presence of ethylene glycol and in the presence of catalysts to obtain pure diglycol terephthalate. According to this principle, it is also possible to transesterify carbamate groups in polyurethane compositions.

However, the most common method of recycling polymer waste is to separate them by methanol-methanolysis. The process is carried out at temperatures above 150 ° C and at a pressure of 1.5 MPa, accelerated by transesterification catalysts. This method is very economical. In practice, a combination of glycolysis and methanolysis methods is also used.

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