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PROCESSING OF POLYETHYLENE TEREPHTALATE WASTE INTO AROMATIC COMPOUNDS – COMPONENTS OF AUTOMOTIVE GASOLINES

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The study is devoted to solving the problem of expanding production of aromatic hydrocarbons (benzene, toluene, xylenes, etc.), which are of strategic importance for the domestic economy. This is of particular importance given that the main Ukrainian producers of these substances – the petrochemical and coke industries – suffered significant losses as a result of armed aggression. The article examines the prospects for processing PET waste into components of automotive gasoline – namely aromatic hydrocarbons. At present, PET waste is among the most abundant polymer wastes. PET waste is generated at all stages of the product life cycle, from production to consumption and disposal. Such waste is characterized by high resistance to biodegradation and therefore can cause significant negative environmental impacts. At the same time, PET waste serves as a source of valuable feedstock for chemical recycling processes, which, in turn, makes it possible to obtain products of economic importance while simultaneously addressing the problem of hazardous waste accumulation.
The PET waste processing approach proposed in the article involves hydrolysis to obtain terephthalic acid as the target intermediate product, which can subsequently be converted – via catalytic decarboxylation and hydrogenolysis – into either benzene or toluene and xylenes. For the practical implementation of this technology, process flow schemes are proposed that integrate feedstock preparation, direct processing, catalyst regeneration, and product separation. The key factors for increasing the practical yield of target products and the effectiveness of their application under the conditions of operating oil refineries are analyzed.
Key integration points for the production of aromatic hydrocarbons from terephthalic acid into automotive gasoline production at refineries are identified. These integration points make it possible to increase refinery operational flexibility (by balancing petroleum and secondary sources of aromatics), reduce costs associated with crude oil procurement (through partial substitution with secondary feedstocks), generate additional revenue from PET waste utilization, improve the quality of commercial gasoline due to high knock resistance, and reduce the carbon footprint of gasoline production by decreasing the share of fossil feedstocks used in producing marketable products.

Keywords: automotive gasoline; PET waste; processing; aromatic hydrocarbons; gasoline components; additives; anti-knock properties; integration points.

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