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UTILIZATION OF RUBBER AND PLASTIC WASTES IN CO-PRESENT

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One of the most important problems of modern resource-saving technologies is determination of the pollution of environment with plastic wastes, especially plastics based on polyethylene, polypropylene, polystyrene and rubber products based on natural and synthetic rubber. The main methods of utilization these wastes is storage in landfills or incineration. However, there is no one method, which can solve the problem of environmental pollution. Most polymeric materials are not able to turn under the action of microorganisms to environmentally friendly substance, also burning of rubber materials may cause the formation of gaseous and solid wastes, which are must be disposed too. Connection with this, developing effective methods of utilization of rubber and plastic wastes is one of the most important tasks in our world. In recent scientific publications and patents have been appearing reports about various directions and methods of recycling plastic and rubber wastes into valuable organic substances. One of direction of recycling such wastes is thermal and thermo catalytically degradation until hydrocarbon fractions, which are after suitable treatment can be used as a high quality motor fuel.

Nowadays, the way of recycling plastic wastes gets relevant not only from the environment, but also due to the fact that the polymer wastes are raw and powerful energy source. Using of polymer wastes allows save primary raw materials (especially oil) and electricity [1-4].

So, on this research work we illustrate experimental data of catalytic treatment plastic wastes by hydrogenation. As raw materials were used crushed polymeric materials based on polypropylene, polyvinyl chloride and polystyrene. In the role of a catalyst of the process was used natural bauxite, zeolites, wastes from bauxite ore is red sludge and acid catalyst - potassium iodate. Instead source of hydrogen and as a binder of raw materials was used paste formation based on heavy oil residue from "Kumkol" field, with boiling point above 500°C. The experiment was carried out on the batch-type installation at a pressure from 0,4-0,5 to 1,8-2,9 MPa and a temperature from 150°C to 450°C under continuous stirring.

Was studied the influence of rubber wastes to the yield and fractional composition of products in plastic hydrogenation process. See table 1. It showed that the presence of rubber wastes slightly increases the yield of liquid products. It can be explained by contents of polymer cord in rubber, which is also exposed during the conversion process.

Table 1. The influence of proportion *of plastic (P): rubber (R) : Paste Formation (PF)* to the yield of liquid products of plastic wastes by catalytic thermal hydrogenation process (T = 450°C, m_{kt} = 0,67g, τ = 15 min, P: R: PF = 1:1:1 - m_{kt} = 10g, P: R: PF = 1:1:2 - m_{kt} = 7,5g)

The proportion of P: R: PF	$P_{max,}$, MPa	Yield of gas Weight%	Yield of Liquid Product, weight %				Yield of sludge, weight, %	Loss of weight, %
			before 180°C	180-250°C	250-320 °C	$\sum_{LP}$		
1:1:1 without catalyst	2,8	50,9	8,0	7,1	7,1	22,2	23,8	3,1
1:1:1 with catalyst	2,3	43,4	12,1	8,6	9,9	30,6	21,4	4,6
1:1:2 with catalyst	2,7	47,6	11,3	8,3	9,7	29,3	17,7	5,4

Thus, it is shown that optimization of process conditions and selection of suitable catalysts to recycling of plastic wastes by the hydrogenation process can give considerable interest and be helpful in the development of non-waste technology. Using of natural hydrogen donor can reduce economic expenditures and facilitate the process of hydrogenation, which is minimizing the step of producing hydrogen [5].

References

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