PRODUCTION OF PRODUCTS FROM RESINS OF UNDERGROUND COAL GASIFICATION

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Abstract. *This article discusses the methods of using coal in metallurgy and the research methods obtained in gasification. This shows the importance of coal in the metallurgical industry.*

Keywords: *coal, metallurgy, gasification, coking, molar concentration.*

ПРОИЗВОДСТВО ПРОДУКТОВ ИЗ СМОЛ ПОДЗЕМНОЙ ГАЗИФИКАЦИИ УГЛЯ

Аннотация. *В данной статье рассматриваются способы использования угля в металлургии и полученные методы исследования при газификации. Это показывает важность угля в металлургической промышленности.*

Ключевые слова: *уголь, металлургия, газификация, коксование, молярная концентрация.*

INTRODUCTION

In connection with the depletion of natural hydrocarbon - raw material reserves in the Republic of Uzbekistan, work is underway to obtain hydrocarbon products from the processing of Angren brown coal. During the development of coal chemistry, the process was sufficiently developed, but at present, pyrocondensate and tar from underground coal gasification are used unskilledly, the latter gasification is a supplier of only energy gas.

MATERIALS AND METHODS

This is explained, firstly, by the fact that coal chemistry as a branch of industry has no independent significance and is constantly dependent on the situation in the ferrous metallurgy, and, secondly, by the low quality of its products obtained by existing methods. The latter leads to the fact that they do not find application in the organic synthesis industry, which prefers to use mass and high-quality refined products. Because the competitive ability of oil products is mainly due to the large scale of production and the low cost of raw materials. The development of coal chemistry will cease to depend on the conjuncture in ferrous metallurgy if new processes are developed based on flexible and selective principles for the separation and subsequent processing of the separated fractions by advanced physical and chemical methods.

RESULTS

A significant qualitative leap in the development of coal chemistry is possible with the creation of a single production based on chemical products of coking, semi-coking and underground gasification of coal. Cooperation on the basis of raw materials requires a thorough study of all the main factors affecting the efficiency of the process. As our studies have shown, hydrogenation under low pressure can completely process the resin - the main product formed during the pyrolysis of coal. Many regularities are common for resins of high-temperature and medium-temperature pyrolysis. The success of the hydrofinishing process is determined by the use of effective catalysts, the creation of optimal molar concentrations of hydrogen when the pressure is reduced to 5 atm, and the presence of low-boiling diluents [1]. The experiments were carried out on a flow unit with a reactor volume of 0.5 l. Pyrolysis resin of Angren brown coal was used as raw material.

An experimental sample of a catalyst system based on aluminium-nickel and molybdenum contributes to the formation of valuable chemical products during tar hydrocracking under underground coal gasification (CGC). To this end, we studied the process of hydrocracking of CCG tar from Angren coals in a microlaboratory setup at 550–650°C and a hydrogen pressure of 5.30 and 50 at. The molar concentration of hydrogen was constant in all experiments and was provided with hydrogen circulation of 1000 l/kg of raw material. Characteristics of the resin used as a raw material is given in table. 1. Hydrocracking was carried out with a mixture of raw materials and low-boiling diluent in a ratio of 1:1. The degree of conversion of raw materials and the yield of fractions were determined during the process.

Table 1 - Composition Properties of Narrow Fractions of CCGT Resin Sample

Boiling limits, °C	Exit %, масс.	Dense awn at 20°C	Relative molecular weight	Index refraction at 20°C	Iodine number	Qty. sulphated% масс.	Content on raw materials	
							Unsaturated hydrocarbons	Aromatic carbs prenatal
Before 100	2,75	0,9282	135	1,5203	48,43	84,6	0,71	1,61
100-170	0,71	0,9429	141	1,5210	46,88	90,0	0,18	0,45
170-200	4,75	0,9610	138	1,5321	47,98	93,3	1,23	3,20
200-230	17,85	0,9706	141	1,5471	51,57	93,3	5,12	11,50
250-270	5,85	0,9833	159	1,5702	48,73	96,7	1,78	3,87
270-300	12,74	1,0028	177	1,5823	48,95	89,2	4,35	7,05
300-320	7,95	1,0399	214	-	-	-	-	-
320-360	19,70	1,0785	216	-	-	-	-	-
Rest above 360	20,60	-	478	-	-	-	-	-
Total	100,0						15,43*	30,00*

DISCUSSION

The catalytic system under study strongly retains hydrogen in pores. This basically prevents the flow of side processes at medium and low pressures. An increase in pressure partially suppresses coke formation.

The data of three series of experiments (at 550, 600 and 650°C) show that at 550°C the increase in pressure does not affect the formation of coke. This indicates that the rates of saturation of fragments of molecules with hydrogen are rather high compared to compaction reactions. At 600°C, the coke yield decreases from 1.2 to 0.3%, and at 650°C, from 1.3 to 0.5%. The decrease in coke formation can also be explained by the fact that more hydrogen is consumed with increasing pressure.

CONCLUSIONS

Experimental studies show an increase in the amount of formed aromatic hydrocarbons depending on the temperature increase as a result of the conversion of the remainder of the raw material, boiling above 320°C. A decrease in pressure can be compensated by an increase in temperature or a decrease in space velocity. From a technological point of view, it makes more sense to increase the temperature.

Comparing the results, we see that when the pressure is reduced from 50 to 5 atm and the temperature is increased from 550 to 600°C, in the first case, and from 600 to 650°C, in the second case, the depth of raw material conversion does not decrease, but increases. When the pressure is reduced to 5 atm, the degree of conversion of unsaturated hydrocarbons at temperatures of 550-600°C does not exceed 7.8%. This phenomenon can be explained by the fact that when the pressure is reduced, the residence time of an unsaturated hydrocarbon molecule in the chemisorbed state on the catalyst surface decreases so much that saturation of unsaturated compounds with hydrogen does not occur. With an increase in temperature from 600 to 650°C, the degree of conversion of unsaturated hydrocarbons increases, but apparently does not reach a maximum.

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