Gasification of oil-shales for hydrogen containing gas production

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Abstract

Currently, oil and gas are far and wide used as the main sources of raw materials for power and chemical industry. However, reduction of explored reserves and operating problems in production activity lead to increase in oil and gas prices. Therefore economically developed countries give special consideration to the matter of solid fossil fuels application. In this case worldwide spread oil-shales can be regarded as important potential feedstock for fuel, power and chemical production.

Oil-shales are considered to be perspective feedstock for fuels production and chemical industry. Considerable content of hydrogen in organic matter and higher yield of crude shale oil under thermal decomposition distinguish oil-shales from other solid fuels.

In this work, the research results of thermolysis of oil-shales from Kashpir (Russia) and Baltic (Russia, Estonia) shalefields are presented. In order to enhance the process efficiency catalytic conversion stage, NiO was used as catalyst, was carried out. Obtained results show that for Kashpir oil-shales content of hydrogen in gaseous products is higher than for Baltic one (Table). The last one is characterized by large share of CO_2 in gaseous products (62-64 %), indicating considerable amount of mineral components. Obtained data shows that quite intensive conversion of oil-shales takes place under sufficiently high temperatures (500~650°C). Also it should be noted that for Kashpir oil-shale concentration of hydrogen in gasification products reaches 89.8%.

Table. Kashpir and Baltic oil-shales thermolysis gas composition (%)

Reaction temp. (°C)	Kashpir oil-shales				Baltic oil-shales			
	H_2	CO	CO_2	CH_4	H_2	CO	CO_2	CH_4
500	25,6	15,9	12,1	33,9	8,7	16,2	62,5	14,4
500 (NiO)	40,9	8,5	14,8	28,5	19,6	16,6	42,7	21,1
600	55,3	7,2	5,1	17,8	31,1	8,0	46,7	11,2
600 (NiO)	80,1	2,1	2,5	12,1	35,4	4,7	53,2	6,7
650	73,1	4,6	6,2	8,0	32,8	7,9	49,3	10,0
650 (NiO)	89,8	3,8	24	3,9	49,9	6,7	36,0	7,4