ALTERNATIVE TECHNOLOGIES FOR OIL SHALE LIQUEFACTION AND UPGRADING

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In this work the results of working out the fundamentals for oil shale more effective liquefaction compared with that practised are represented as a comparative study. The maximum liquid yields obtained in Kukersite oil shale pyrolysis, hydrogenation and thermal dissolution are represented. Also, the conditions found out for Kukersite maximum liquefaction and the chemical composition of oils obtained is characterised and comparised.

As high as 98% (on kerogen bases) liquid product yield from the Kukersite can be obtained by thermal dissolution using sub- and supercritical hydrocarbons, water, lower alcohols or their mixtures while fast pyrolysis, semicoking and direct hydrogenqation result in 60-65% liquid yields. Significant differences in obtained liquids (extract, hydrogenate, oil) chemical composition were noticed. The extracts of thermal dissolution are characterised as heavy bituminous kerogen modification which contains hydrocarbons only to a small degree and is totally soluble in benzene. Hydrogenate is represented mainly by gasoline and diesel fraction compounds and characterised as rich in hydrocarbons. Typical semicoking oil contains up to 30% different oil-soluble and water-soluble phenols. About 50% of total oil obtained in semicoking makes the heavy oil fraction 360 °C+. In the composition of light-middle destillate the content of hydrocarbons is moderate. Due to not forming yet or modified already both extract and hydrogenate practically not contain phenols. Compared with the semicoking, hydrogenation and thermal dissolution yield outstandingly less solid organic residue.

Thermal dissolution with sub- and supercritical solvents as well as direct hydrogenation of oil shale with molecular hydrogen generate higher yields of valuable liquid compounds compared with pyrolysis accompanied by decreased yields of hazardous by-products. The hydrogenate can be characterised as partially upgraded product transferred rather closer to the natural oil than shale oil. The extract, vice versa, represents an intermediate which further thermochemical processing can lead to obtaining non-conventional oil and chemicals as well.