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PROBLEMS AND PROSPECTS IN GAS-TO-LIQUID TECHNOLOGY FOR THE PRODUCTION OF ENVIRONMENTALLY FRIENDLY MOTOR FUELS

Taking into account the reduction of world oil resources, development of technology for the motor fuel synthesis from alternative raw materials is becoming more and more crucial. The most known is Gas-to-Liquid (GTL) process that turns shorter chain hydrocarbons into longer chain hydrocarbons. Variety feedstock can be used for GTL technology. Although natural gas is dominant for these technologies, associated gas and biogas are also used. Key steps of gas to liquid conversion are feed gas purification, syngas production, synthesis of liquid products by the Fischer-Tropsch method, and reforming of liquid hydrocarbons [1].

The technology for producing synthetic liquid fuels (SLFs) has a number of drawbacks, including significant complexity, high water consumption and in some cases the presence of the plant or line for oxygen production. In spite of given drawbacks, GTL fuels are more environmentally friendly. The mixture of C5 - C19 hydrocarbons ("synthetic oil") has a high degree of purity and can be used as chemical and petrochemical raw materials, because it does not contain sulfur and nitrogen compounds, which are usually found in crude oil. All fractions of "synthetic oil" are valuable products. For example, diesel fuel has a high cetane number (70-80 units) and does not contain sulfur and aromatic compounds, which is definitely its advantage since the European Union is making more and more stringent requirements to the total sulfur content in diesel fuels [2]. The kerosene fraction is used to obtain jet fuels and surfactants. The heavier fractions are the basic raw material for the production of oils and lubricants [3].

Despite the obvious advantages of GTL technology, there are several significant disadvantages that require additional researches. First of all, the technical difficulty of operating, because all the processes are carried out at high temperature, and pressure. It is often necessary to arrange additional facilities for obtaining oxygen. All processes are catalytic, starting with desulfurization reactions and production of synthesis gas ending with Fischer-Tropsch synthesis. The reactions take place in a heterogeneous environment with the formation of a large number of by-products. The development of catalysts to increase the selectivity of higher hydrocarbons and avoid the formation of methane and carbon dioxide is an important point for improving GTL technology. The next problem is the high cost of equipment and capacities for GTL plants, which in turn has an impact on the cost price of the final product. These problems can be solved in two ways: by optimizing and simplifying technological processes or by introducing innovations based on additional fundamental research of catalytic GTL technology catalytic processes [4].

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