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Direct oxidation of methane to methanol (DMTM): its role in development and transportation of natural gas resources

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Modern gas chemistry is one of the most rapidly developing branches of energy sector. Forthcoming shortage of conventional liquid fuels heats interest to synfuels and gas-to-liquid (GTL) processes. However, existing routs for conversion gas-phase hydrocarbons into more valuable chemicals and liquid fuels via syngas production is although very efficient but so complex that can not be practically applied for numerous low resources and remote gas fields throughout the World. Besides, with the ratification of Kyoto protocol there exist very important problem of utilization of associated gases to prevent their flaring or venting into atmosphere.

Among alternative ways of natural gas conversion into liquid products one of the most developed is direct partial oxidation of methane to methanol and other oxygenates (DMTM) [1]. Direct partial oxidation is especially prospective for processing of gas from low deposit and remote gas fields as well as gases with high content of heavier hydrocarbons. Although less selective, this process needs significantly lower capital and operating costs for low scale units and may be well competitive with such ways of monetization of natural gas as pipelines or LNG, which besides very high capital costs consume significant part of gas for transportation or processing without rising the quality of the final product.

Low scale DMTM technology especially prospective for combined methanol and energy co-production and when thus produced methanol is used on site for preventing hydrate formation in wells and pipelines. It lets to use air as oxidant instead of oxygen, and power plant fed by gas diluted with nitrogen produces significantly less amount of NO_x. It was also shown that this technology is applicable practically to any gas composition from dry stripped or coalbed gas to oil gases. Moreover, the higher the content of heavier components the less rigid and more profitable process is. Because of predominant conversion of heavier components, it may be considered as a convenient way to remove these components from gas before its subsequent catalytic processing.

Some prospective technological schemes of practical DMTM application are considered.

Reference

1. Arutyunov V.S. Recent results on fast flow gas-phase partial oxidation of lower alkanes. J. Natural Gas Chemistry. 2004. V. 13. No 1. P. 10-22.