

Efficiently and Economically Upgrading Abundant Natural Gas Into Clean Liquid Fuel Under Ambient Conditions

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In US, the production of natural gas is projected to increase by 21% and 50% in 2020 and 2035, respectively, mainly thanks to the recent explosive growth of shale gas exploration. The great abundance and low cost of natural gas offer a unique opportunity for upgrading natural gas to convenient and value-added liquid fuels. Traditionally, methane can be upgraded via thermal process under high pressure (> 300 MPa) at high temperatures (> 600 °C). In this project, a novel electrochemical process is designed to upgrade methane to methanol under ambient pressure/temperature. Such a designed electrochemical process is based on hydroxyl radical as a powerful activating agent in aqueous system. In addition, the intrinsic flexibility of electrochemical process also allows for seamless integration of renewable electricity as clean and inexpensive energy input. The project may provide an alternative approach to efficiently and economically utilize abundant natural gas nationally and internationally.