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Shale Natural Gas Liquids Upgrading Process: Two-Step Catalytic Process or Alkane Dehydrogenation Followed by Oligomerization

A two-step catalytic process efficiently converts low-value shale gas hydrocarbons into high-value chemicals and transportation fuels, drastically reducing processing steps, capital investment, and energy consumption.

Ethane, propane, butane, and higher gas hydrocarbons are derived from shale gas and expensive to transport from remote production locations. In addition, the markets for their use are saturated, which means additional hydrocarbons have low value. The existing methods for converting light alkanes into chemicals are expensive. However, transportation fuels have a very large market with high values. A method for increasing production of transportation fuels will lead to increasing value of shale gas fields and low cost fuels for the nation.

Researchers at Purdue University have developed a two-step catalytic process, and improved catalysts for both process steps, for the conversion of shale gas hydrocarbons to higher molecular weight hydrocarbons useful for chemicals and fuels. This process requires fewer processing steps, less capital investment, and lower energy use when compared to existing technologies. This process applies to both large- and small-scale applications including near the shale gas wellhead. As natural gas production increases, there is a potential $20 billion market for conversion of ethane, propane, and butane to liquid fuels.

Advantages:

-Fewer processing steps

-Low capital investment

-Low energy use

Potential Applications:

Technology ID

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Category

Chemicals & Advanced Materials/Specialty & Performance Chemicals

Energy & Power Systems/Power Generation

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-Jet and diesel fuels

TRL: 3

Intellectual Property:

Provisional-Patent, 2017-09-07, United States | PCT-Patent, 2018-09-06, WO | NATL-Patent, 2020-01-31, United States | CON-Patent, 2023-03-14, United States

Keywords: shale gas conversion, higher hydrocarbons, catalytic process, light alkanes, liquid fuels, transportation fuels, ethane propane butane, low capital investment, low energy use, wellhead application