Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Licensing Opportunity

Production of Hydrocarbons from Natural Gas

Oxygen free process overcomes carbon loss and catalyst instability in current Methyl Bromide conversion systems

Process

Increased demand for natural gas has spurred intensive research activities focusing on methods to overcome existing technical hurdles associated with methane conversion processes for natural gas.

High selectivity towards higher hydrocarbons, carbon loss during catalyst regeneration and catalyst instability due to deactiviation are major challenges blocking **efficient conversion processes for natural gas.**

Researchers at ETH Zurich developed an alternative system overcoming many of these problems using a high pressure, low temperature conversion of methyl bromide over a low-cost Lewis catalyst, aluminum bromide (Figure 1). A two step process control shifts between propane/butane production from methyl bromide to reactor regeneration. The by-product, coke, can be fully integrated into the product stream by hydrogenation in the same reactors, without changes in the catalyst or temperature window. This integrated approach provides a valuable medium-scale alternative to existing oxygen-based activation processes.

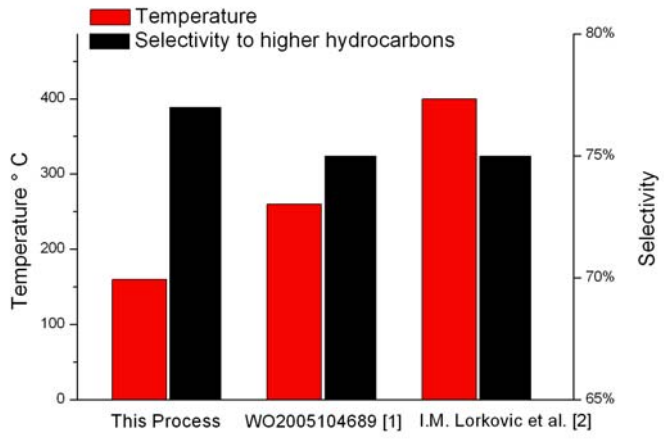

*Figure 1: Comparison of this process to two similar processes ([1]: Patent WO2005104689, **2005** [2]: I. M. Lorkovic et al.,A novel integrated process for the functionalization of methane and ethane: bromine as mediator, Catalysis Today, **2004**, 98, 317.)*

Competitive Advantages

- Less Corrosion
- No carbon loss by oxidation—carbon deposits are reused and converted into methane and higher hydrocarbons
- Long-term catalyst stability:not prone to deactivation or sintering
- Continuous process—no intermediary cleaning required
- Feasibility demonstrated on a 1 mol scale in a large laboratory setup
- Low Temperature (< 190°C)

Applications:

- **Production of C_2-C_5 Alkanes:**

  Ethane, Butane, Propane, Pentane

Additional Information:

N. Osterwalder, W.J. Stark, **Direct Coupling of Bromine-Mediated Methane Activation and Carbon-Deposit Gasification**, ChemPhysChem, 8(2), 297-303 (2007).DOI: 10.1002/cphc.200600491

Further Development:

Industrial partner to advance process to pilot scale.

Keywords

Lewis acids
Conversion of Natural Gas
carbon loss

Patent Information:

US, EP Patent Pending

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Contact

ETH Zurich
ETH transfer, HG E 48.2
Raemistrasse 101
8092 Zurich, Switzerland
Phone: +41 44 632 23 82
Fax: +41 44 632 11 84
transfer@sl.ethz.ch