Compact High-Throughput Modular FT Reactor with Monolithic Catalyst Bed

Battelle Number(s): 15740

Patent(s) Issued

Available for licensing in all fields

SUMMARY

The present technology is a compact, high-throughput, modular FT reactor that shows promise in economically producing fuels and chemicals from syngas at small scales. The reactor may be scaled up by increasing the number of planar reaction/heat exchanger modules. Each module comprises numerous ~1mm reaction channels within a monolithic catalyst (Re/Co) and support structure.

Economical syngas conversion is needed for the production of liquid fuels and chemicals from renewable or remote hydrocarbon sources at capacities much smaller than conventional Fischer-Tropsch (FT) plants. A conventional FT plant that utilizes natural gas as the feedstock is typically integrated into a petrochemical and/or refinery complex operating at high processing capacity to achieve large scale economy. By contrast, most renewable energy or remote hydrocarbon sources (e.g., biomass, industrial wastes, and municipal solid wastes) are of small capacity and unstable supply and are often distributed at various geographic locations. The conventional FT process becomes cost-prohibitive at such a capacity that is orders of magnitude smaller than the typical petrochemical plant or oil refinery.

ADVANTAGES

- Economical for small, remote, or distributed hydrocarbon sources for syngas production.
- Increased CO conversion and reduced methane selectivity in a single pass.
- Reduced wax plugging of reaction channels.
- Improved temperature control.
- Ease for scale up.
STATE OF DEVELOPMENT & AVAILABILITY

- Proof-of-principle has been demonstrated in the laboratory where 92~98% CO conversion with less than 10 % of CH4 selectivity during one pass is obtained under typical F-T reaction conditions.
- The gas superficial linear velocity was found as one critical parameter that may allow scale-up of the hydrodynamics from the small-scale laboratory tests directly to practical sizes.

PATENTS & INTELLECTUAL PROPERTY

- 8,101,140

TECHNOLOGY PORTFOLIO(S)

- Microtechnology

POTENTIAL INDUSTRY APPLICATION(S)

- Automotive & Transportation
- Chemicals
- Energy & Utilities
- Oil & Gas
- Recycling & Waste Management

CONTACT

Sara M. Hunt
Pacific Northwest National Laboratory
(509) 375-6555
sara.hunt@pnnl.gov
https://availabletechnologies.pnnl.gov