

TECH OFFER

Eco-friendly Direct Conversion of Biogas into Liquid Fuels



KEY INFORMATION

TECHNOLOGY CATEGORY:

Energy - Biofuels & Biomass

Energy - Waste-to-Energy

Sustainability - Circular Economy

Sustainability - Low Carbon Economy

TECHNOLOGY READINESS LEVEL (TRL): **TRL4**

COUNTRY: **SINGAPORE**

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OVERVIEW

Liquid fuels from biogas are a promising source of renewable and clean energy as they give a lower emission of sulphur dioxide, nitrogen oxide, and soot than conventional fossil fuels. They are sustainable and economically viable as they can be obtained from agricultural waste. However, transforming biogas into a high-value liquid fuel equivalent to diesel or gasoline requires a costly two-step process.

The technology developer has developed a novel enhanced capsule catalysts with unique core-shell structures that enable the production of high value-added liquid fuels from biogas in a single step with only one reactor. These capsule catalysts directly convert synthetic gas (syngas) into liquid fuels, which have improved petrol-like qualities. Therefore, these liquid fuels can be used either as diesel or gasoline substitutes without any modification to engines and existing refuelling facilities.

The technology developer seeks companies looking for renewable and clean energy through the gas-to-liquid (GTL) technology to license and commercialise this technology.

TECHNOLOGY FEATURES & SPECIFICATIONS

The novel enhanced capsule catalysts have a unique core-shell structures to produce liquid fuels from biogas in a single step. The capsule catalysts have the following properties:

- Dual functionalities, which bring about gas-to-liquid reactions while enabling catalytic cracking and isomerisation, thus achieving a one-step process
- Excellent durability and high surface area, enabling a higher yield of liquid fuel
- A robust mesoporous framework that is optimised for the conversion rate of reaction
- High selectivity for shorter-chain or light hydrocarbon (C5-C10) and a high CO conversion, allowing biogas to be converted more efficiently into high-value liquid fuels within a shorter period of time

The direct conversion of syngas allows liquid fuels to be obtained with properties similar to diesel or gasoline, as a renewable and clean energy source, without any modification to engines and existing refuelling facilities.

The technology developed for catalyst production and syngas conversion to liquid transport fuels is highly scalable. This technology has the potential to reduce the overall cost of the process as only one reactor is required with these novel catalysts as compared to two reactors using the existing technology.

POTENTIAL APPLICATIONS

Biogas has been identified as one of the sustainable and economically viable solutions because the feedstock can be obtained from agricultural wastes and wastewater from industries, either locally or from neighbouring regions. Therefore, this technology has the potential to penetrate the market for catalytic materials in the gas-to-liquid processes.

Suitable for:

- Poultry farms
- Food waste treatment plants
- Wastewater treatment industries

Companies who are looking for renewable and clean energy through the gas-to-liquid (GTL) technology to diversify their energy sources.

Applications:

- Diesel or gasoline substitutes

UNIQUE VALUE PROPOSITION

- Reduce gas-to-liquid production costs as only one reactor is required
- Ability to obtain liquid fuels with properties similar to diesel or gasoline without further modifications
- Scalable

- More efficient compared to the existing technology with a single-step process conversion to liquid fuel