

TECHBRIEF

CONVERTING NATURAL GAS TO VALUABLE CHEMICALS WITH MICROWAVE TECHNOLOGY

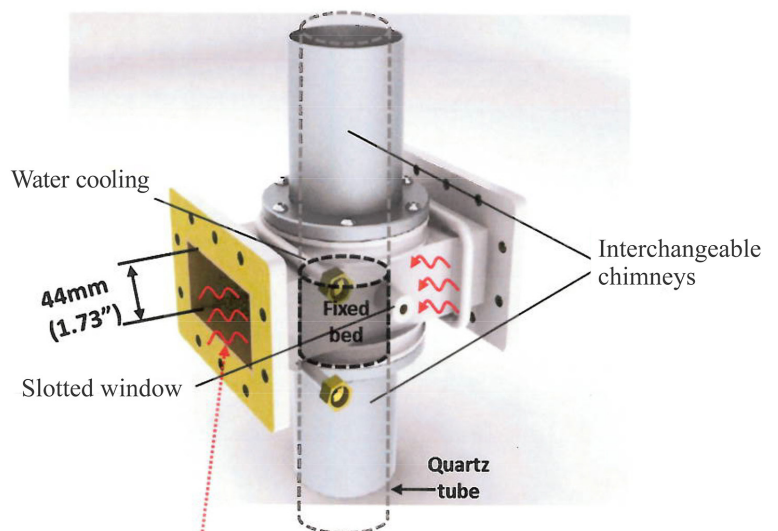
OPPORTUNITY:

This novel patent-pending methane conversion technology employs microwave-assisted catalysis for chemical conversion. This technology is available for licensing and/or further collaborative research from the U.S. Department of Energy's National Energy Technology Laboratory.

CHALLENGE:

Natural gas, primarily composed of methane, is a cheap and abundant domestic resource that can be converted to a wide range of products including liquid transportation fuels and a wide range of chemical intermediates. However, traditional methods of converting methane to valuable chemicals first require it to be converted to synthesis gas.

A direct, one-step, method to convert the methane would have significant advantages over current indirect methods, including reduced costs and increased yields, but several technology barriers must first be overcome. Microwave-assisted catalyst reactions can provide a viable direct method for overcoming these barriers.



OVERVIEW:

NETL researchers have developed a direct method for methane conversion using microwave-assisted catalysis. The underlying process involves selectively converting methane to ethylene and hydrogen using microwave radiation. The invention is twofold. First, it provides targeted heating of the active metal sites of a catalyst, thereby enhancing the catalytic activity without increasing the bulk temperature of the surrounding reactants. Second, it plays a role of the catalyst promoter.

Due to selective heating, the MW heating is more energy-effective and is also faster compared to the conventional method in which the reactor is heated first, then transferred to the reaction medium by convection. The ability to selectively produce desired products in a chemical reaction can be greatly improved using catalysts. The general classes of catalytic reactions that deal with the conversion of natural gas are of increasing commercial and scientific interest.

This NETL technology offers multiple advantages over conventional technologies for methane conversion.

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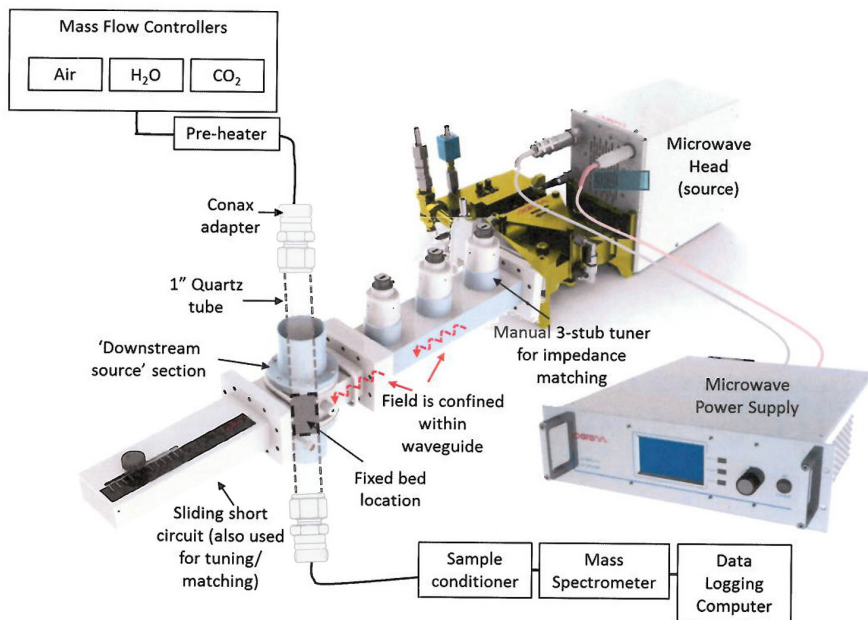
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ADVANTAGES:

- One step, direct methane conversion
- Targeted heating
- Enhanced catalytic activity
- Faster and more-effective

APPLICATIONS:

- Chemistry, Metallurgy
- Combustion Technology and Fuel Cells
- Environmental
- Sensors and Control Systems
- Software and Modeling
- Inorganic Chemistry
- Non-metallic Elements

PATENT STATUS:

- U.S. Non-provisional Patent Application No. 16/355,122 titled, "Electromagnetic Field-assisted Method for Chemical Conversion" Filed 10/18/2018

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