

NETL'S MICROWAVE CATALYSTS PRODUCE CARBON NEUTRAL HYDROGEN FROM CAPTURED CARBON DIOXIDE AND WASTE METHANE

NETL has scaled novel microwave catalysts from atomic-level design to pre-pilot scale demonstration and kilogram-scale synthesis.

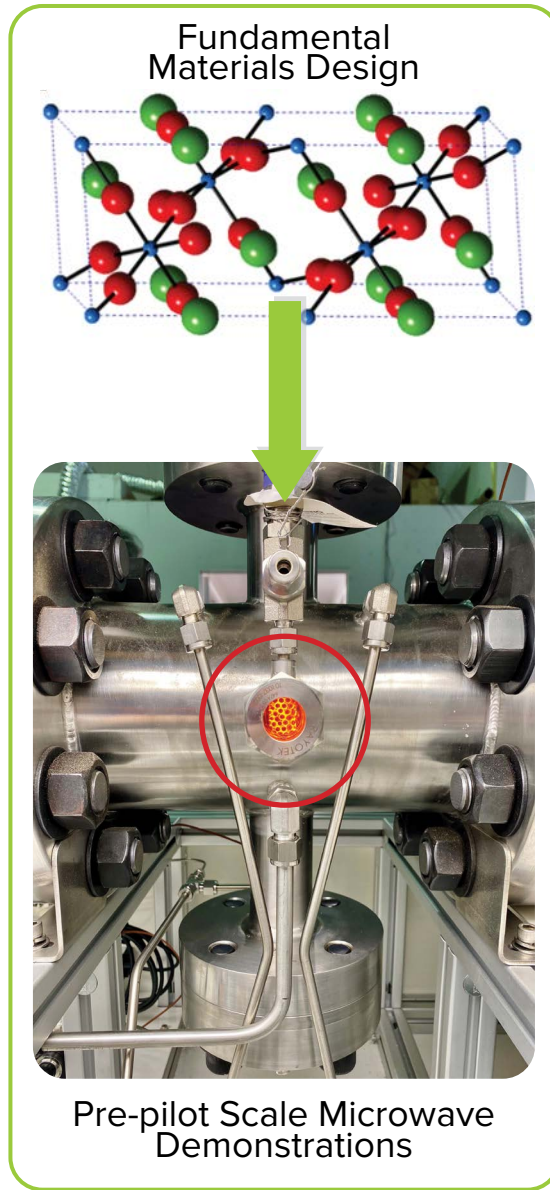
NETL'S MICROWAVE CATALYSTS DEMONSTRATE RECORD-BREAKING EFFICIENCY

NETL's microwave catalysts demonstrate **twice the energy efficiency** of electrochemical CO₂ conversion technologies and **exceed the DOE's 2020 goal for electrochemical H₂ production** (<44 kWh/kg H₂).

NETL is applying a unique set of tools in a multidisciplinary approach to microwave technology development. Combining extensive material development capabilities, state-of-the-art microwave reactor facilities, and advanced computation resources, research teams collaborated to understand how microwaves interact with fossil fuels at the molecular level, in bench-scale experiments, and simulations of larger scale operations.

BENEFITS OF MICROWAVE-ASSISTED CATALYTIC PROCESSES

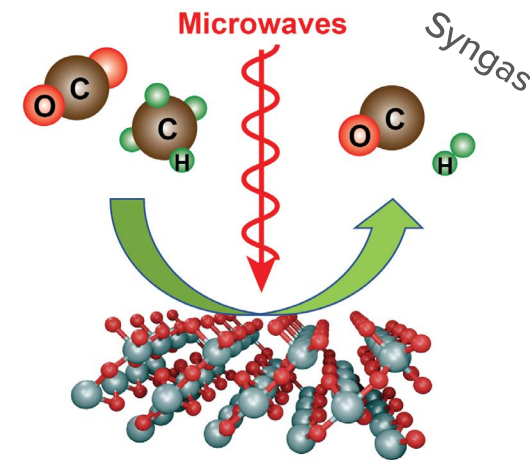
- Rapid, selective heating with microwaves provides process intensification by reducing reactor size and downstream separation units.
- May be used to mitigate process upsets allowing for continued operations for processes requiring long restart times.
- Flexibility and tunability of microwave fields allow system to respond to variations in feed rate and composition, as well as to intermittent periods of reduced resource availability.
- Microwave systems can operate using excess, carbon-neutral electricity, making the technology comparable to state-of-the-art electrochemical technologies.



MICROWAVE TECHNOLOGY CAN HASTEN TECHNOLOGY COMMERCIALIZATION

Microwave energy is uniquely suited for modular applications due to the process intensification it provides through rapid, selective heating of a reacting system. Modular systems provide an opportunity to hasten the advance of technologies to commercialization by allowing the scale of a process to be increased with additional, smaller units, rather than by increasing the size of the system.

NETL MICROWAVE CATALYSTS CONVERT CAPTURED CO₂ AND WASTE METHANE INTO H₂ AND CO (SYNGAS)



SYNGAS AS FEEDSTOCK TO MAKE A MULTITUDE OF VALUE-ADDED CHEMICAL PRODUCTS



U.S. PATENTS PENDING AND INDUSTRIAL PARTNERS ENGAGEMENT IS UNDERWAY

NETL has filed patents and authored many peer-reviewed publications demonstrating proof-of-concept of this technology.



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FWP-1022426

PROJECT BUDGET
FY21 - 22 FUNDING



● DOE\$598,234

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FECM RDD&D PRIORITIES

- LOW-CARBON INDUSTRIAL SUPPLY CHAINS
- ACCELERATE CARBON-NEUTRAL HYDROGEN (H₂)
- REDUCE METHANE EMISSIONS