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## Acid-Free Synthesis of Electrocatalyst Technology

Tech ID: 33243 / UC Case 2022-99C-0

### BRIEF DESCRIPTION

The present invention describes a novel method for acid-free pyrolytic synthesis of metal-nitrogen-carbon (M-N-C) catalysts for use in fuel cell/energy conversion applications. This method allows for rapid production of M-N-C catalysts that exhibit high activity and selectivity for CO<sub>2</sub> electroreduction without needing harsh acids or bases.

### SUGGESTED USES

- Fuel cell/energy conversion applications
- Supports CO<sub>2</sub> reduction efforts
- Possible use in N<sub>2</sub> reduction reactions

### FEATURES/BENEFITS

- Acid-free synthesis that lowers manufacturing cost and lowers risk to personnel
- Synthesis time of 1 day (compared to 10-14 days for other M-N-C catalyst processes)
- Exceptional catalytic performance (E<sub>cath</sub> = -1.1 V vs. RHE compared to competing M-N-C catalysts of E<sub>cath</sub> = -0.7 V vs. RHE)

### TECHNOLOGY DESCRIPTION

This technology developed at UCI uses a mechanochemical process to produce highly active electrocatalysts. Through a series of ball milling and two-step pyrolysis techniques, M-N-C catalysts are synthesized which exhibit high activity and selectivity for CO<sub>2</sub> electroreduction without needing harsh acids or bases. This technology is beneficial as it addresses: (1.) issues in CO<sub>2</sub> electroreduction efficiency (2.) Costly and hazardous chemical disposal of acid after catalyst synthesis, mitigating environmental concerns (3.) lengthy manufacturing time required with current processes.

### STATE OF DEVELOPMENT

This method is at the working prototype stage. A synthesis has been optimized for CO<sub>2</sub> reduction. Further optimization (e.g. oxygen reduction reaction) could be tested for industrial applications. A provisional patent describing this method has been filed.

### PATENT STATUS

Country	Type	Number	Dated	Case
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### CONTACT

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### INVENTORS

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### OTHER INFORMATION

### CATEGORIZED AS

- » **Energy**
  - » Hydrogen
  - » Other
- » **Materials & Chemicals**
  - » Chemicals
- » **Nanotechnology**
  - » Materials
- » **Semiconductors**
  - » Design and Fabrication
  - » Materials
- » **Transportation**

## RELATED CASES

2022-99C-0

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

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