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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 CO₂ electroreduction without needing harsh acids or bases.

SUGGESTED USES

- Fuel cell/energy conversion applications
- Supports CO₂ reduction efforts
- Possible use in N₂ 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_{cath} = -1.1 V vs. RHE compared to competing M-N-C catalysts of E_{cath} = -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 CO₂ electroreduction without needing harsh acids or bases. This technology is beneficial as it addresses: (1.) issues in CO₂ 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 CO₂ 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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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

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

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