Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M23-273P^
Published: 4/16/2024

Inventors

Ivan Ermanoski
Ryan Milcarek
Ellen Stechel
James Miller

Contact

Physical Sciences Team

Thermo-Electrochemical Cycle and Reactor for Hydrogen and Carbon Monoxide Production

Background

The creation of effective energy conversion technologies has become essential in response to the challenges of integrating diurnally and seasonally intermittent and variable renewable energy resources. Specifically, one of the most important steps toward the economical production of sustainable fuels and organic chemicals is the conversion of carbon dioxide and water into hydrogen and carbon monoxide, a key chemical precursor mixture know as synthesis gas or syngas. The overall conversion efficiency, capital costs, and responsiveness of state-of-the-art technologies cannot meet the need for economical renewable syngas production. As a result, the development of the thermo-electrochemical cycle and reactor is a pertinent and timely invention.

Invention Description

Researchers at Arizona State University have developed a thermo-electrochemical cycle and reactor that presents a paradigm shift in the production of hydrogen and carbon monoxide. This novel technology provides a hybrid solution that synergistically integrates electrochemical and thermochemical processes. The cycle increases productivity and efficiency through precisely controlling reactions at lower temperatures by utilizing a special bias voltage. The concept stands out from current technologies due to lower operating temperatures, quicker start/stop times, and lower capital expenditures. With profound effects on resource use and energy sustainability, the thermo-electrochemical cycle and reactor offer a revolutionary approach to the production of sustainable fuels and chemicals.

Potential Applications

- Renewable energy infrastructure
- Transportation sector
- Chemical industry
- Energy storage

Benefits and Advantages

- Environmental sustainability
- Energy efficiency
- Cost-effectiveness
- Resource utilization