Electrochemical Semi Cylindrical Cell

IITM Technology Available for Licensing

Problem Statement

- Existing electrochemical cells are designed to study the **working of electrode reaction kinetics** at various Temperature, Pressure and Concentration in three-electrode system.
- Current cells **lack efficient methods** to selectively heat working electrode for observing & enhancing reactions in a **localized manner**.
- External heat sources, like infrared sunlight or industrial/vehicular exhaust heat, are not used well to **improve electrochemical reactions** in current cell designs.
- **Integrating external heat sources** into the **working electrode of H-cell system** is the current challenge in **cell design**.
- Addressing these challenges could improve our **understanding of reactions at different temperatures, benefiting technologies** like fuel cells and metal-air batteries by leveraging Temp. variations for **optimized performance**.
- Hence, there is a need for a **technology** to **heat the working electrode alone**, enabling **precise observation and optimization** within an Electrochemical Cell setup.

Technology Category / Market

Categories: Electronics & Circuits | Chemistry & Chemical Analysis

Industry: Electrochemical Cells

Applications: Electrochemical Devices, Energy Technologies, Energy Science, Electrochemistry

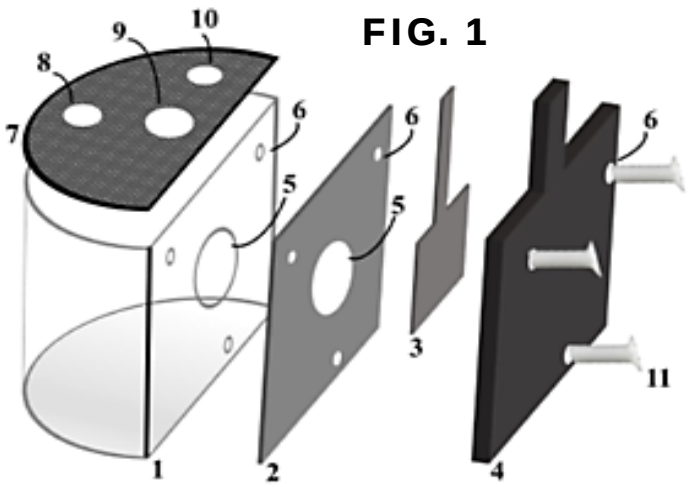
Market: The global electrochemical cell market is estimated to be at **US$ 23.73 B** in **2023.** It is expected to reach **US$ 67.05 B** by **2030**, growing at **16% CAGR** from 2023 to 2030.

Technology

The present patent invention discloses an E**lectrochemical Glass Semi-Cylindrical Cell** designed with specific parts for precise control. **FIG 1** shows a perspective structure of entitled cell. **It comprises of**:

- Working electrode
- Graphite plate for heating
- Teflon cap
- Gasket for leakage prevention.

FIG. 1



Key Features / Value Proposition

User Perspective:

- Enables precise control and study of reactions at varying temperatures.
- Optimizes **energy device performance** by utilizing external heat sources.
- Serves as a **sophisticated tool** for optimizing electrochemical reactions.

Industrial Perspective:

- **Maximizes industrial heat sources** for improved energy device efficiency.
- Offers **potential advancements** in fuel cell & batteries **via temperature optimization**.
- Provides **adaptable solutions** for tailored electrochemical reaction studies.
- To **transcend traditional electrochemical kinetics measurement** the potential benefits of **integrating localized heating**, especially through **sunlight;** goes beyond conventional electrochemical instrumentation & metrology.

Technical Perspective:

- Enables **precise heating** of working electrode for localized reaction observation.
- Efficiently **integrates external heat sources** into cell design.
- Provides **comprehensive insight** of reaction kinetics at varying temperature conditions.

Research Lab

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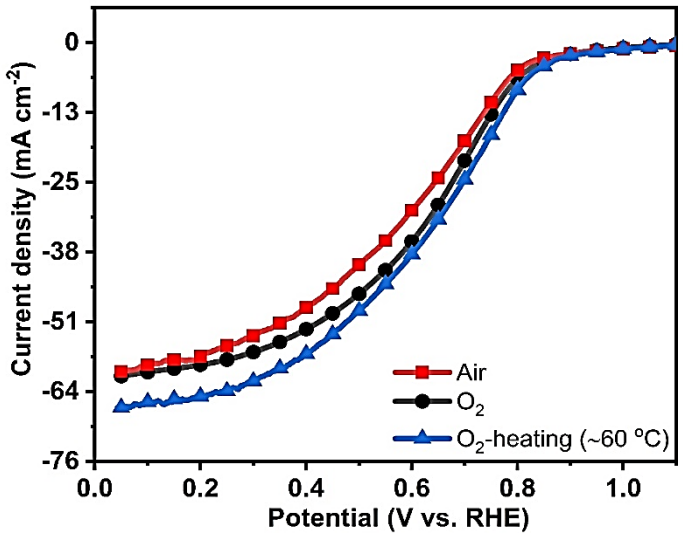

FIG 2 depicts a scenario of linear sweep voltammogram (LSV) curves in acidic electrolyte

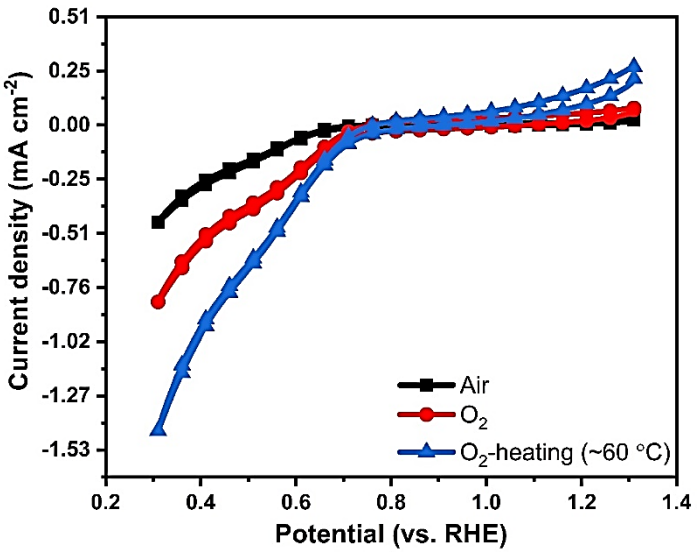

FIG 3 depicts a scenario of cyclic voltammetry (CV) curves in alkaline electrolyte

Intellectual Property

IITM IDF No: 2272
IP No: 404435 (**Granted**)

TRL (Technology Readiness Level)

TRL – 3; Proof of Concept

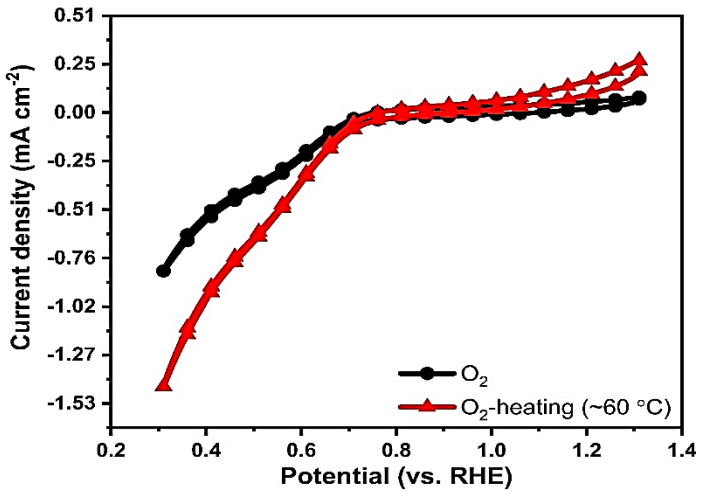

FIG 5 depicts a scenario of CV curves in alkaline electrolyte before and after heating of working electrode

Function: Allows selective heating of the working electrode for localized observations in a three-electrode setup.

Temperature-Selective Control:

- Enables precise temperature variation solely on the working electrode.
- Facilitates the study of reaction kinetics at different temperatures for enhanced understanding.

Heat Harvesting and Localization:

- Utilizes external heat sources like infrared sunlight or industrial heat for enhanced reactions.
- Ensures effective localization of heat onto the working electrode for improved reaction observations.

Enhancement in Energy Devices:

- Potential impact on fuel cells and metal-air batteries by optimizing reactions based on temperature variations.
- Offers opportunities for improved efficiency and performance in energy conversion technologies.

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