PILLAR-SUPPORTED ELECTRODE FELT FOR HEADERS OF ELECTROLYTE/ REACTANT DISTRIBUTION CHANNELS

IITM Technology Available for Licensing

Problem Statement

- Flow batteries offer efficient energy storage, but they face challenges related to factors like electrode efficiency, ion crossover, and material selection.
- Felt electrodes are a promising option for flow batteries, but they **suffer from issues like increased pressure drop, flow channel blockage**, and uneven electrolyte distribution.
- These problems can lead to decreased energy efficiency and reduced performance in flow batteries and fuel cells.
- Thus, there is a need to **develop an enhanced electrolyte circulation** for enhanced performance of the batteries.

Technology Category/ Market

Category- Electrochemical Energy Storage
Applications- Redox Flow Batteries used for energy storage
Industry- Energy Storage, Fuel Cells, Battery

Market- The flow battery market size is expected to reach USD 0.76 billion in 2023 growing at a **CAGR of 15.4%** to reach USD 1.55 billion by 2028.

Technology

The present invention presents a flow battery cell with a headers and a flow field in which short pillar-like support structures are located in the headers to support the electrode felt in order to improve the performance of the cell.

The headers in the flow fields such as the interdigiated flow field as shown in Figure 2, are highly prone to felt intrusion leading to unwanted side effects therein.

A flow battery cell according to the present invention, comprises of: a) electrodes having an electrode felt; b) a flow field with one or more headers; and c) pillar supports in the one or more headers.

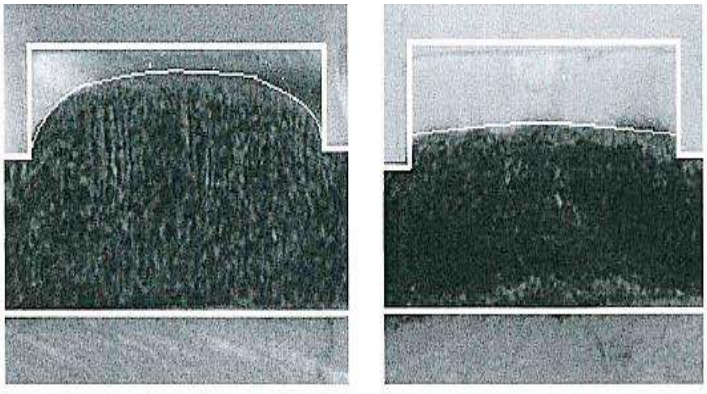

Fig.1 (a) illustrates an experiment showing a large intrusion (bulging) of an electrode felt into the rectangular channel;
Fig.1 (b) illustrates reduced intrusion when the felt is supported by pillars.

Intellectual Property

- IITM IDF Ref. **1859**
- **IN 430901 - Patent Granted**

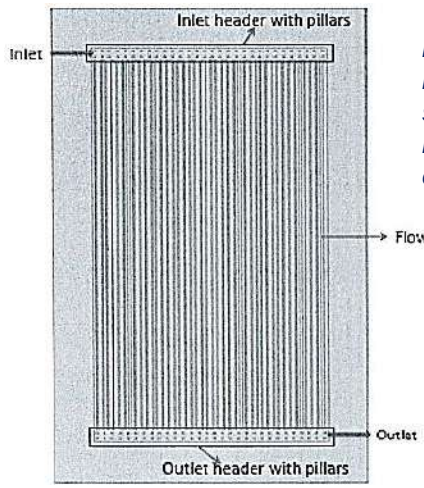

Fig.2. illustrates a schematic representation of flow field.

TRL (Technology Readiness Level)

TRL - 3, Proof of concept stage

Research Lab

Prof. Sreenivas Jayanti,
Dept. of Chemical Engineering

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

Key Features / Value Proposition

1. **Enhanced Flow Distribution:**
The invention introduces pillar supports within flow battery headers, mitigating the problem of electrode felt intrusion into flow channels. This innovation significantly improves flow distribution within the battery.
2. **Reduced Flow Blockage:**
The pillar supports prevent the porous felt electrodes from bulging into the flow channels, reducing the risk of flow blockage, uneven electrolyte distribution, and increased pressure drop.
3. **Improved Battery Performance:**
By maintaining a consistent flow of electrolyte **a**nd reactants, the invention enhances the overall performance of flow batteries, ensuring efficient energy storage and discharge.
4. **Application Versatility:**
This technology can be applied to various types of electrodes, including chemically or thermally active electrodes, making it adaptable to a wide range of energy storage applications.
5. **Optimization Potential:**
The location and distribution of pillar supports can be customized for specific headers and flow fields, allowing for optimization to meet the unique requirements of different battery designs.

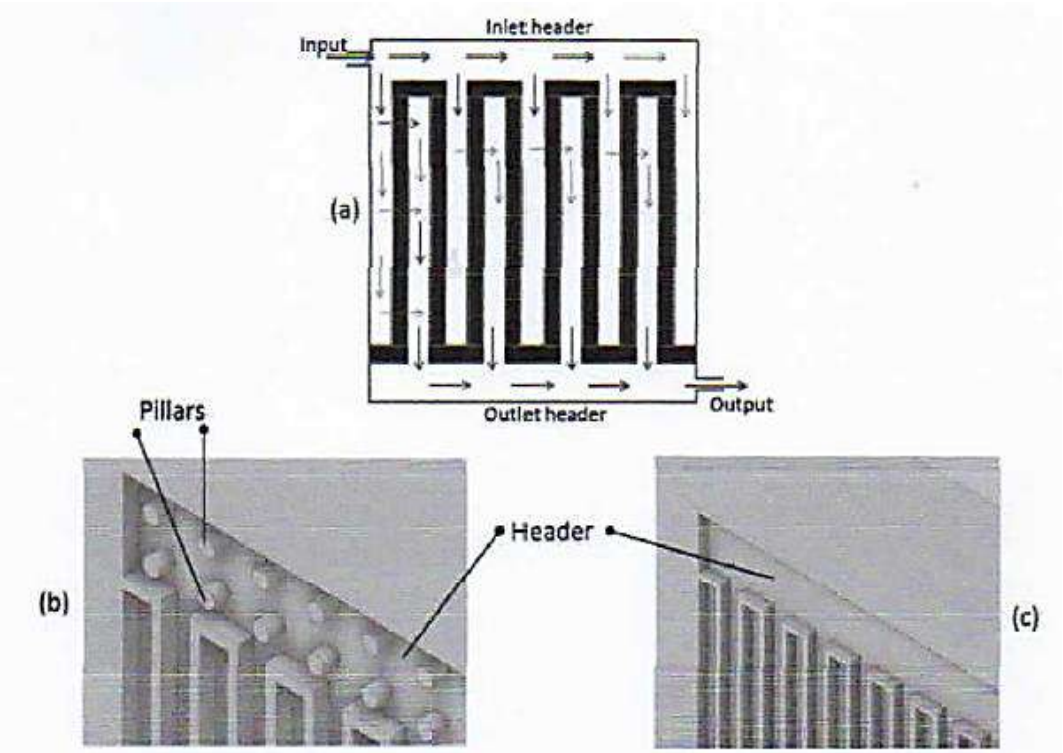

Fig.3. (a) illustrates an interdigitated flow field;
Fig.3. (b) illustrates an interdigitated flow field with an indicative arrangement of a header with pillar supports for the electrode felt;
Fig.3. (c) illustrates an interdigitated flow field with an indicative arrangement of a bare header without pillar supports.

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719