

### SUPER-HYDROPHOBIC MATERIAL COATED GRAPHITE MIXED FLOW FIELD PLATE, METHOD FOR PRODUCTION AND ITS APPLICATION THEREOF

**IITM Technology Available for Licensing**

#### Problem Statement

- In present era, the ever-increasing harmful effects of fossil fuels, there is a need to deploy renewable & green technologies and **polymer electrolyte membrane Fuel cell (PEMFC)** is introduced as most efficient power conversion technologies with zero emission.
- However, the important **challenge** in PEMFCs is **water management** which need to be solved.
- A few patent & non-patent literatures discussed herein with different coating layers but **could not address the above issues.**

#### Technology Category/ Market

**Technology:** PEMFC including super-hydrophobic graphite coating;

**Industry:** Fuel cell, Electronics, Automobile, energy & infrastructure; **Applications:** PEM Fuel cell, Transport, portable;

**Market:** The global **polymer electrolyte membrane Fuel cell (PEMFC)** market size is expected to reach **\$2 Billion** by **2030**, at a **CAGR of 7%**.

#### Technology

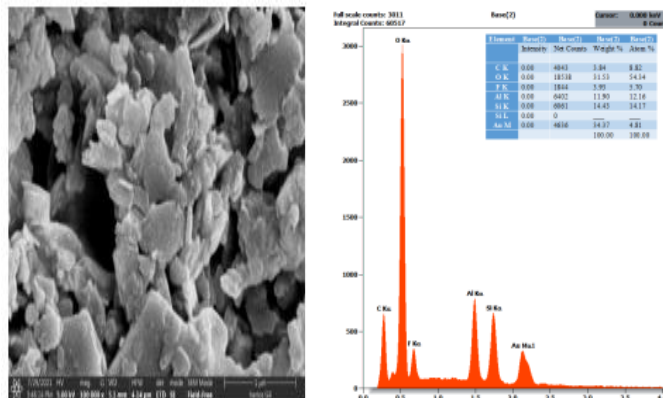
- Present Patent describes about a **super-hydrophobic** material coated **graphite** mixed-flow field plate, & further featured in smart charts.

1. Super-hydrophobic material coated graphite mixed-flow field plate is chemically modified **aluminosilicate-based clay particles** dispersed in **water** and has a contact angle in the range of **156° to 160°**.

2. Said patent discloses about a **fuel cell having cathode electrode** made of a **super-hydrophobic material coated graphite** flow field plate which is having high contact angle.

3. Disclosed material possesses **low surface energy** that is needed to **repel water at different temperatures** which is essentially needed for the **fuel cell's application**, considering cell's **durability**.

#### Images



**FIGs 1a&1b.** illustrate scanning electron microscopy (SEM) image & X-Ray analysis of super-hydrophobic material coated graphite plates used in PEMFC;

#### Key Features / Value Proposition

- ❖ **Technical Perspective:** Subject Fuel cell is a PEM **fuel cell** which helps in **enhancing water management & prevent slogging**.
- ❖ Said fuel cell helps in **achieving a maximum power density of 0.36W/cm<sup>2</sup>**.
- ❖ **Industrial Perspective:** Advantage of the PEMFC with super-hydrophobic graphite surface which operates **continuously** at **enhanced static current density** & worked **without purging**.

#### Intellectual Property

**IITM IDF Ref.2240;**  
**IN Patent No: 429719 (Granted)**

**TRL (Technology Readiness Level)**

**TRL- 4, Proof of Concept ready & validated**

#### Research Lab

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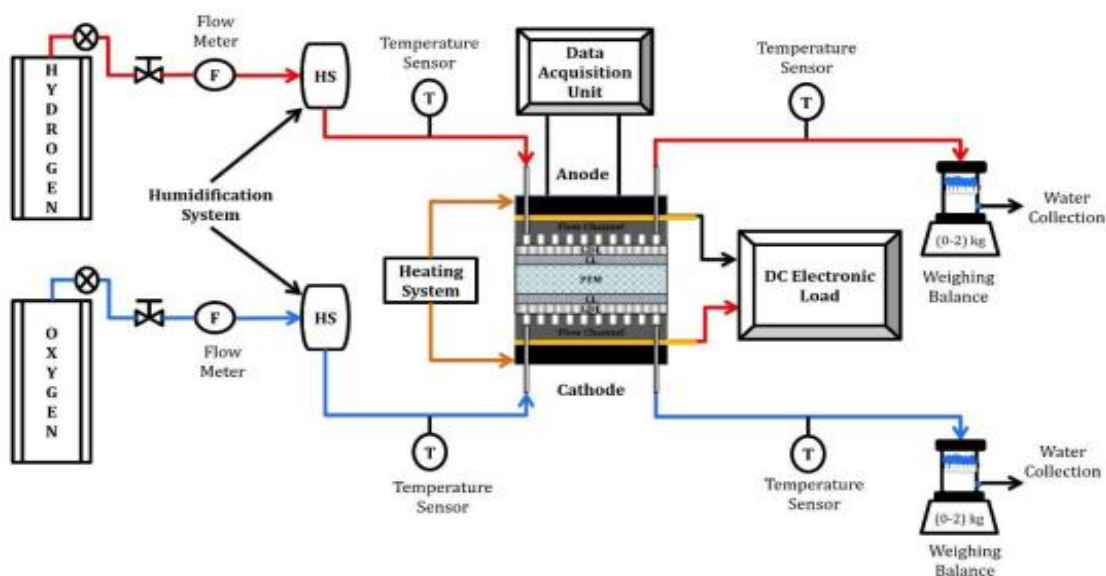
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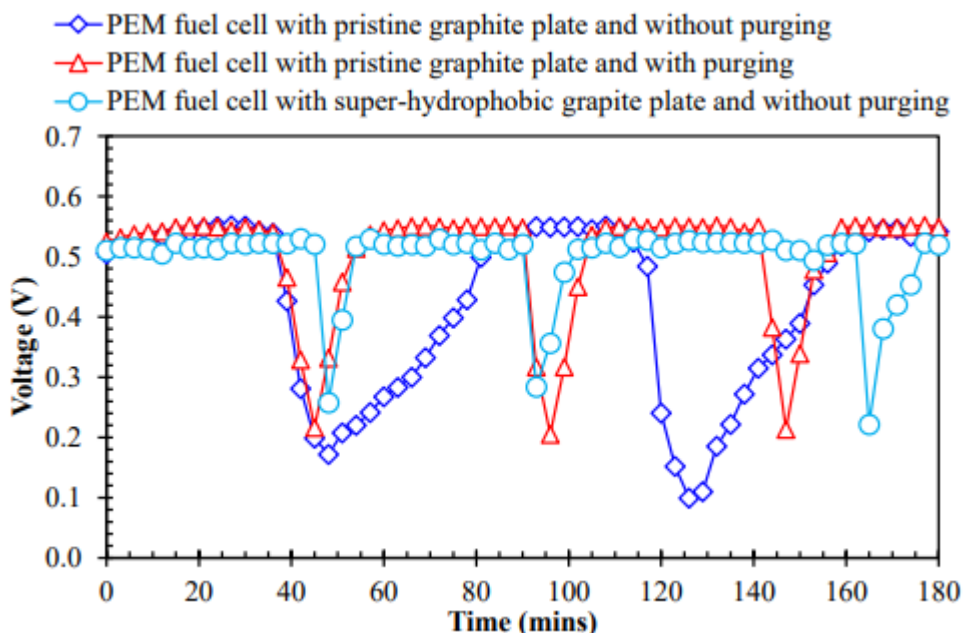
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**Fig. 2:** depicts the experimental setup of the Polymer electrolyte membrane (PEM) cell.



**Fig. 3:** shows variation of PEM Fuel Cell voltage with time at maximum current density of 0.8 A/cm<sup>2</sup> and cell heating of 60°C.

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