AN ELECTROLYZER SYSTEM WITH NONPRECIOUS ELECTROCATALYSTS FOR GREEN H_2 PRODUCTION BY ELECTROLYSIS OF WATER

IITM TECHNOLOGY AVAILABLE FOR LICENSING

Problem Statement

- In the present era, the cost-effective production of hydrogen (H_2) is the vital research area, wherein clean water splitting driven by electricity or solar power is one of the most promising approach.
- Further, using of **clean Aqua water** is **costlier** and **resources are limited**.
- In this instant, the **clean water** can be replaced by **natural resource water** like **sea water with or without treatment** for the process of production of H_2.
- One of the major issues cause while using of real sea water during **electrolysis process** is that said **water** contains **several salts**, and that form **participates** on the **cathode surface**, which **obstructs** to reach **the benchmark of current density**.
- Therefore, there is need for an electrolyzer system and framework to overcome above issues.

Technology Category/ Market Z

Sustainable Energy and material science : Green H_2 Production, Hydrogen Electrolyzer; **Industry:** Renewable Green Hydrogen; **Application(s)**: Green H_2 Production
Market: The global green Hydrogen market was valued at USD 676 million in 2022 and is projected to reach **USD 7,314 million** by **2027,** growing at a CARG of **61.0%** during the forecast period.

Intellectual Property

IITM IDF Ref: 2319
IN Patent No. 419116 (Granted)

Technology

Electrocatalyst development:

- **Anode** Catalyst layer is designed by using a framework type structure i.e Cobalt hexacyanoferrate (Co-FePBA) mixed with nitrogen doped carbon nanotube (NCNT) and heated at different temperatures (300-400°C) to obtain Co-FePBA/NCNT composite.
- **Cathode** Catalyst layer is designed by Metallic nickel particles encapsulated inside nitrogen-doped carbon tubules (Ni/NCT).
- Carbon based substrate is used as catalyst support instead costly metallic foam.
- In present electrolyzer system, the **KOH treated sea water** is used as an **electrolyte** for testing purpose. Further, the **ground water or salty ground water** may be used as electrolyte as discussed in the Patent.
- **Design Framework:** The electrolyzer system comprises an anode catalyst layer, a cathode catalyst layer and a catalytic support for the anode catalyst layer and cathode catalyst layer.
- **Problem Solution:** Best anode-cathode assembly of the present invention shows overall water splitting voltage of 1.88V in 1M KOH treated seawater with a benchmark current density of 10mA/cm^2 required for a 12.8% efficiency solar cell driven electrolyzer.

TRL (Technology Readiness Level)

TRL- 3/4 Proof of concept ready Stage

Research Lab

Prof: S. Ramaprabhu
Department of Physics, IIT Madras

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

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

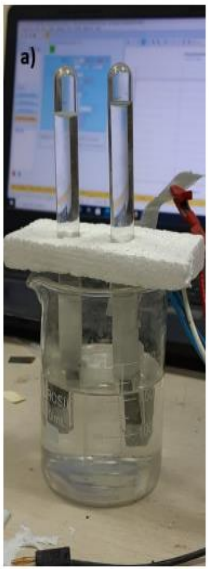
Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

AN ELECTROLYZER SYSTEM WITH NONPRECIOUS ELECTROCATALYSTS FOR GREEN H_2 PRODUCTION BY ELECTROLYSIS OF WATER

IITM TECHNOLOGY AVAILABLE FOR LICENSING

Images

FIG. 1: Illustrates electrolysis in untreated seawater;



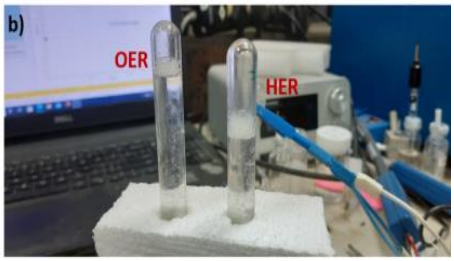


FIG. 2: Illustrates lab-made simple electrolyzer in KOH treated seawater and production of O_2 and H_2 collected in inverted glass tube;

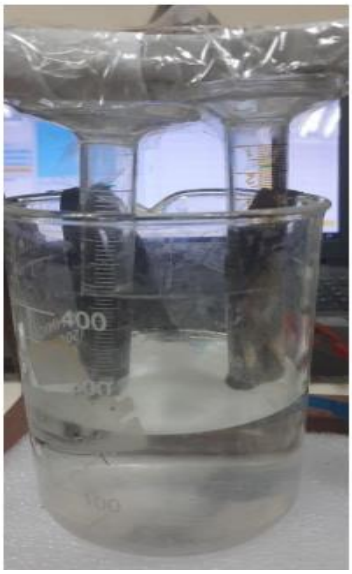


FIG. 3: Illustrates lab-made simple electrolyzer for salty groundwater;

Key Features / Value Proposition

❖ ***Industrial Perspective:***

The present electrolyzer system is feasible to produce green hydrogen from the natural resource of water i.e. **treated seawater ground water and salty ground water**.

❖ ***Technical Perspective:***

The deployment method of the present electrolyzer system is **non-precious, cost effective** and straightforward synthesis of cathode and anode catalysis of sea water electrolysis for efficient H_2 production.

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