

HYDROGEN GENERATION FROM WASTE WATER VIA GALVANIC CORROSION OF IN-SITU FORMED ALUMINUM AMALGAM

IITM Technology Available for Licensing

Problem Statement

- The main threats to **human health** from heavy metals are associated with exposure to **lead, cadmium, mercury and arsenic**.
- Heavy metal pollution** is a long time issues.
- Though there are several reports for detection of mercury, but a fruitful process which can **remove and utilize the contaminant** is yet to be **developed**.
- Hydrogen** is one of two natural elements that combine to **make water**. It has a **very high calorific value** and hence it is a **good energy carrier/ fuel**. It is useful as an **energy source in fuel cells and batteries**.
- While hydrogen is a clean fuel, the main challenges associated with its application have to do with difficulty in **material storage and transportation, safety, low rate, etc.**

Hence there is a need to develop a **new method to overcome above mentioned problems**, which is disclosed in the **present patent**.

Technology

The present patent discloses a **process for generating hydrogen from mercury containing waste water** via in situ synthesis of a **hydrolytic amalgam**, which does not undergo **passivation by alumina layer on its surface** like other similar systems. **The method comprising the steps of:**

- providing aluminium salt to the water to remove mercury from the water wherein aluminium (Al) salt reacts with mercury in the water to form Al amalgam (nano or microaluminium amalgam);

- producing hydrogen gas from the water by reacting the water with aluminum amalgam through borohydride addition, wherein the aluminium amalgam reacts with the water to produce the hydrogen gas;

- remove Hg from water in granular form.

Technology Category/ Market

Category: Chemistry & Chemical Analysis

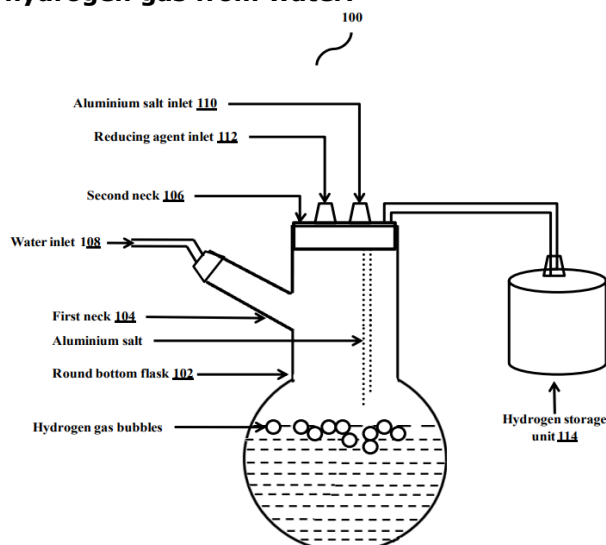
Industry: Catalysts, Fuel Cells Wireless, Energy

Application: Hydrogen production and water purification by the removal of toxic mercury.

Market: The global hydrogen generation market is projected to grow from **\$ 150.20 B** in **2021** to **\$ 220.37 B** in **2028** at **5.6% CAGR** in forecast period of **2021-2028**.

Key Features / Value Proposition

- The **nanoaluminium amalgam and aluminium nanoparticles react** with water and generates hydrogen at a very high rate (**-580 ml/min or 25.89 mM/min per 0.5g of AI salt**) at room temperature.
- The rapid hydrogen generation mechanism is attributed to **galvanic corrosion of amalgam** that helps in **bypassing AI or AI amalgams** towards **hydrolysis** due to the presence of **alumina layer** on its surface.
- The process **removes Hg** from contaminated water & **produces Hydrogen**, overcomes **hydrolytic material storage and transportation** problems without any **catalyst, or other extra reagent**. It uses **common and easily available starting materials**, and it can also be done using **normal tap & pure water**.
- FIG. 1** illustrates an apparatus for producing hydrogen gas from water.



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Hydrogen Generation from Waste Water via Galvanic Corrosion of in-situ formed Aluminum Amalgam
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Images

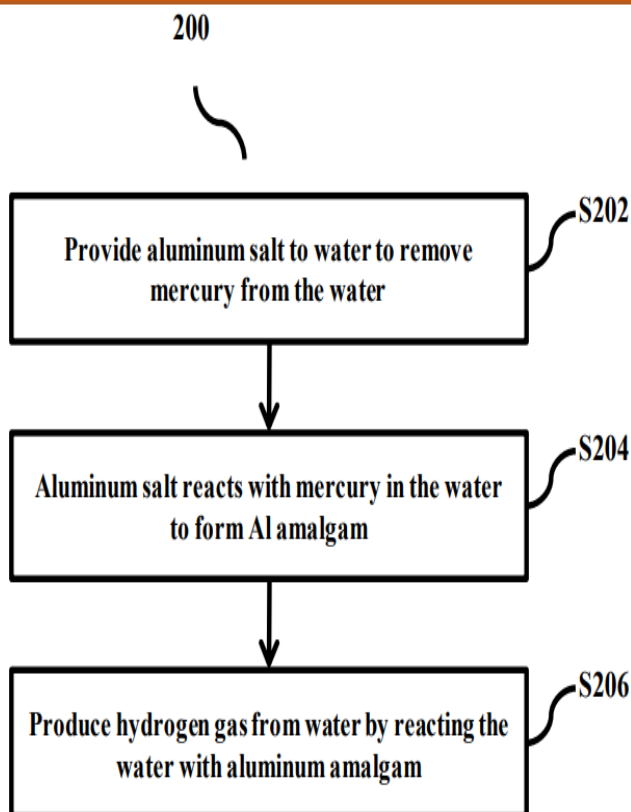


FIG. 2 is a flow chart illustrating a method for producing hydrogen gas from water

TRL (Technology Readiness Level)

TRL- 4, Technology Validated the lab

Intellectual Property

IITM IDF No. 1446

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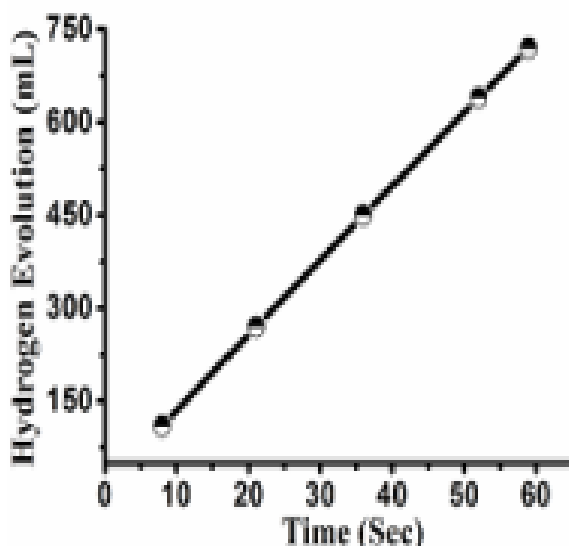


FIG. 3 is a graph illustrating volume of hydrogen produced with respect to time

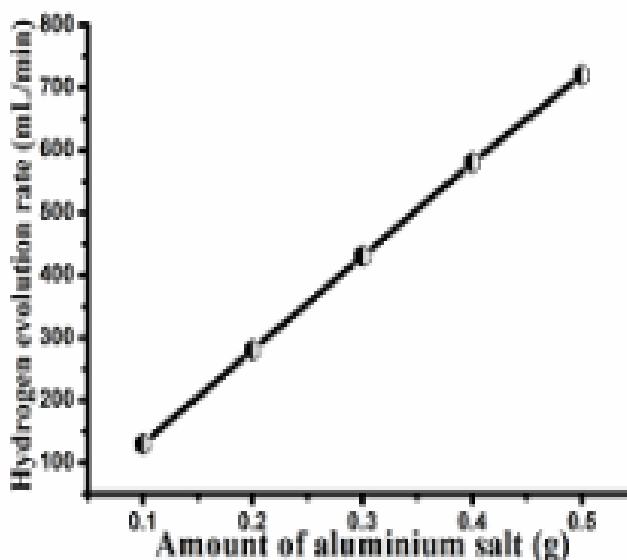


FIG. 4 is a graph plot illustrating rate of hydrogen generation with respect to an amount of aluminium salt

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