

TECH OFFER

Advanced Electrodes and Electrolysers for Cost-Effective Green Hydrogen Production



KEY INFORMATION

TECHNOLOGY CATEGORY:

Materials - Nano Materials

Chemicals - Catalysts

Energy - Fuel Cells

TECHNOLOGY READINESS LEVEL (TRL): **TRL6**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO174936**

OVERVIEW

As a clean burning fuel, green hydrogen plays a critical role in achieving net zero emissions. A major challenge is the high cost of the electrolyser due to inefficient production and the use of precious metals. Innovation in green hydrogen is urgently required to lower its cost and bring it to parity with conventional fossil fuel based grey hydrogen.

A Singapore-based startup has developed a proprietary super-alloy nano-structured material using earth's abundant and cost-effective materials for use in all major electrolyser technologies. These components achieve dramatically higher water-splitting capability and anti-corrosion properties versus commercially available solutions, while ensuring electrode durability, increasing energy efficiency and reducing overall cost. The startup is capable of supporting the manufacturing of core hardware components for electrolyser cells, stacks, and systems, enabling end users to produce the most affordable green hydrogen.

The startup is seeking partnerships with manufacturers (OEMs) of alkaline (AWE), proton exchange membrane (PEM)

electrolysers and leading hydrogen users, including energy majors, utilities, and industrial gas companies, to deploy modular stand-alone anion exchange membrane (AEM) electrolyser systems for pilot projects or for test-bedding at industrial scale.

TECHNOLOGY FEATURES & SPECIFICATIONS

- The patented technology resulting from over 10 years of research in nanotechnology and electrochemistry
- Replacing platinum group metals (PGMs) with low-cost earth abundant nanostructured materials
- Replacing platinum- and gold-coated titanium with an anti-corrosion conductive coating
- Up to 2x current density, hence increasing hydrogen production efficiency
- Offer a high-performance, modular electrolyser stack and system, as well as electrolyser components including catalyst coated electrodes, gas diffusion layers, and bipolar plates

POTENTIAL APPLICATIONS

- Micro grid
- Hydrogen production
- Direct Solar-H₂ panels
- Hydrogen refuelling station
- Multiple types of electrolysers including alkaline, PEM, AEM or membrane-free electrolysers

UNIQUE VALUE PROPOSITION

The electrolyzer systems built with the developed nanomaterials show the following competitive advantages compared with traditional technologies:

- Able to operate at high current density and in a wide dynamic range, i.e., superior compatibility with renewable energy
- Industry-leading efficiency achieving a doubling (200%) in hydrogen production from a given electrolyser cell size
- Up to 30x reduced use of platinum group metals (PGMs) compared to traditional electrolyser technology. These precious PGM metals have been identified as the critical resource constraint on scaling up current electrolyser production.
- Up to 50% reduction in stack size, leading to 50% decrease in capex and space requirements
- Up to 10% decrease in renewable energy consumption, further contributing to sustainability