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FERROUS ELECTRODE MATERIALS

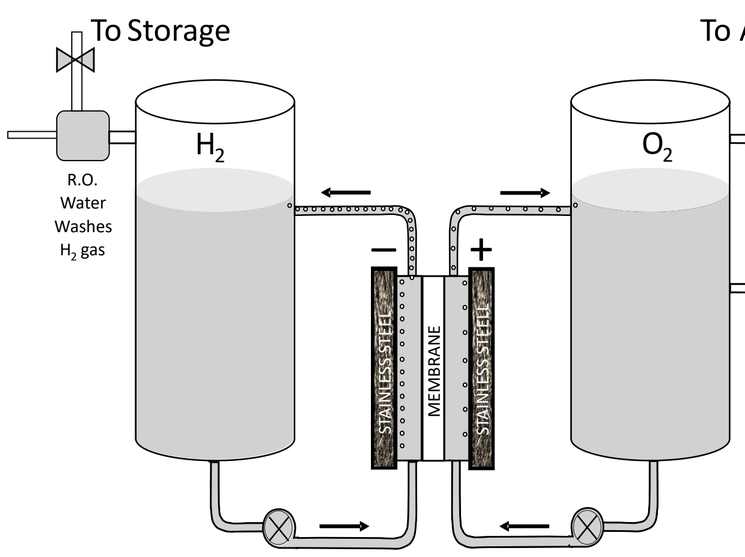
For Battery-electrolyser Systems

Introduction

Battery-electrolyser

TECHNOLOGY combines energy storage and hydrogen production as a cost-effective alternative to electrolysers[1].

Using stainless steel for scalable clean energy solutions.



ZERO EMISSIONS are released when hydrogen is used in a fuel cell to create electricity in a fuel cell.

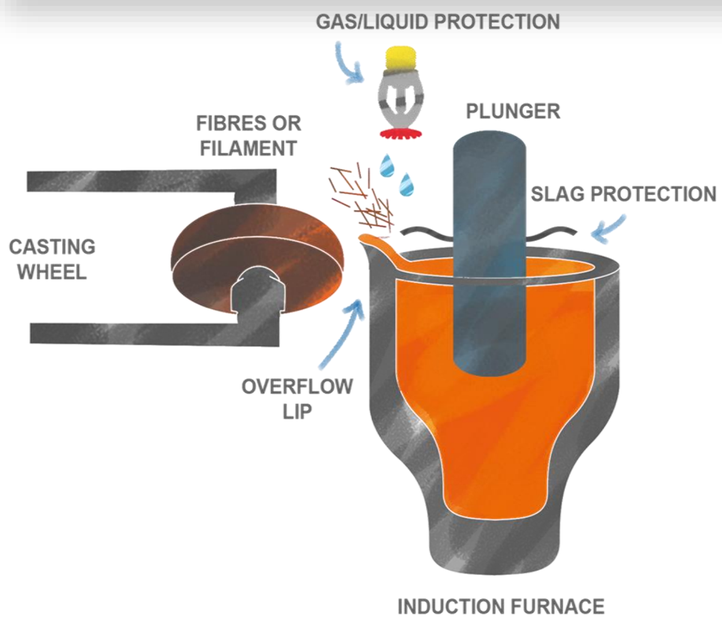
Anode: $H_2 \rightarrow 2H^+ + 2e^-$

Cathode: $\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$

Water is the only waste product

Experimental

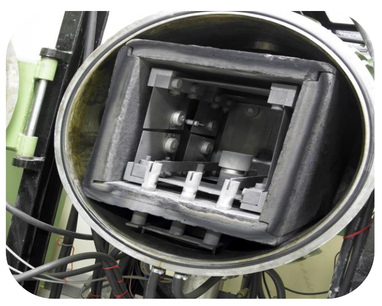
Metal Fibre Network Production Process



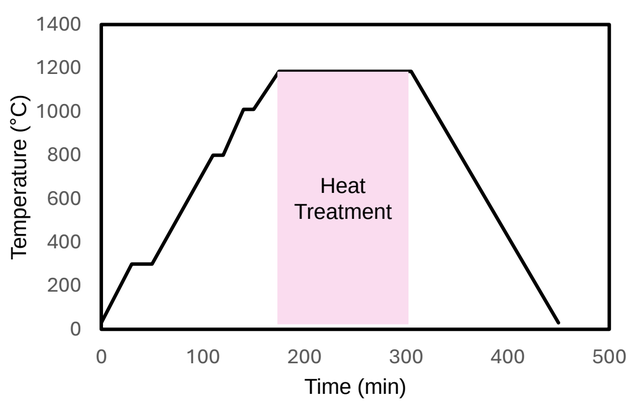
MELT-OVERFLOW

- Rapid Solidification Technology.
- Scalable for industrial applications.
- Diameter: ~100 µm.

SINTERING (VACUUM FURNACE)



- Removes impurities.
- Improves fibre durability and conductivity.



Sintering program
10^{-4} mbar

Results

Prototype Development

01 SS304 Fibres

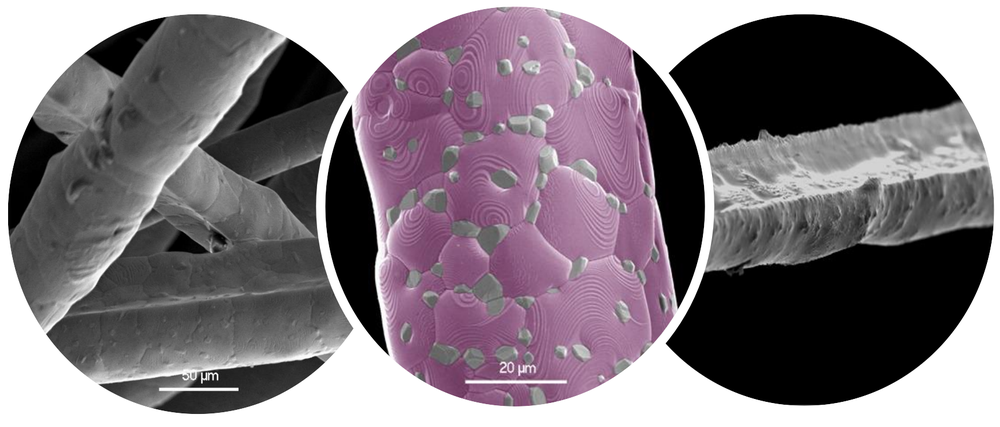
Length: 7mm
Diameter: ~100 µm.

02 Sintered SS304

Dimension: 50X50mm
Thickness: 4mm

03 MFN + SS304 Sheet

Backplate
Thickness: 0.4mm

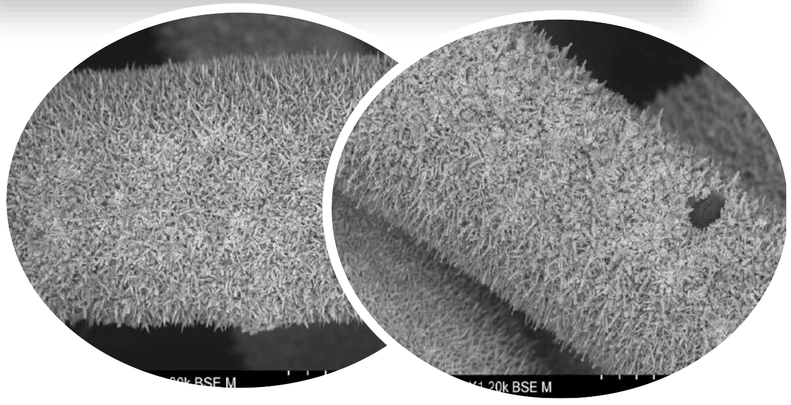


Scanning Electron Microscopy (SEM)

- Sintered bonds
- Surface steps
- Cross-section

Future Work

Coating and Durability Testing

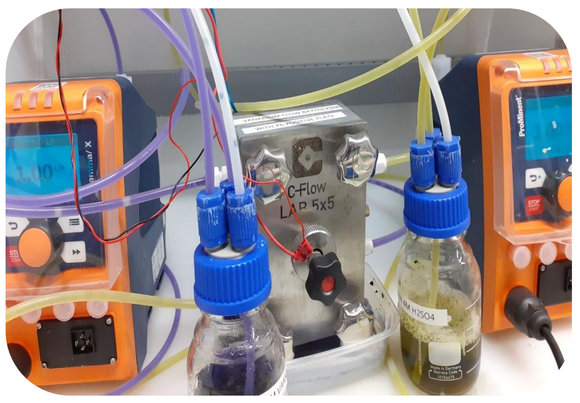


Morphology on MFN (SS446)[2]

- nanoFLUX Coating
- Catalyst Coating

1 Hydrogen 1.008

BE produced H_2
for enhanced storage and delivery



Small-scale Test

- H_2 Production Rates
- Electrode durability
- Capacity as a battery
- Commercialisation

References

1. [1] B. Jenkins et al., "Techno-Economic Analysis of Low Carbon Hydrogen Production from Offshore Wind Using Battolyser Technology," Energies, vol. 15, no. 16, 2022.L. Schlapbach and A. Züttel, Nature, 2001, 414, 353–358.
2. [2] Oxford Nanosystems, "ONS Coatings on Fibretech Mesh" 2024. p 3.

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