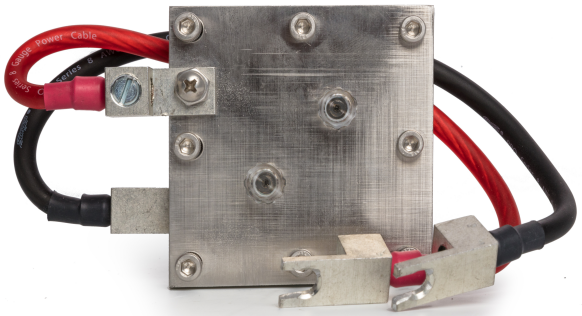
Alkaline Exchange Membrane Electrolyzers: The low cost alternative for renewable hydrogen production?



Base Metal Catalysts vs. Precious Metal Catalysts

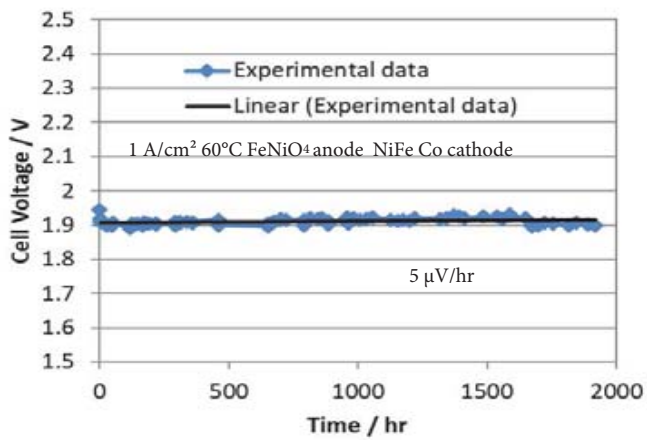
Dioxide Materials has developed anion exchange membranes for alkaline water electrolyzers with base metal catalysts that exceed the performance of previous alkaline water electrolyzers with precious metal catalysts.

Dioxide Materials' design allows one to substitute iron, nickel and cobalt for platinum and iridium. This advance makes electrochemical water conversion to H_2 economically viable for biofuel production.

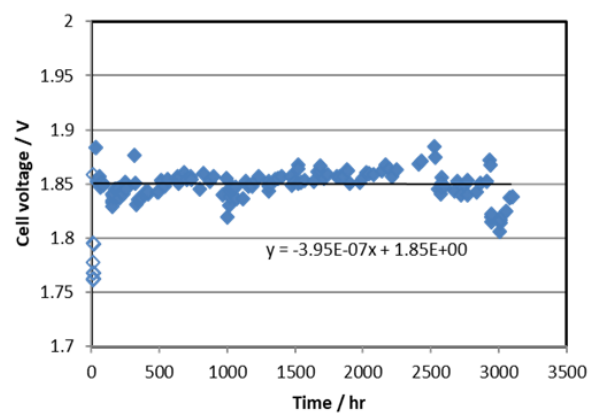
Key benefits of our technology:

- Rapid turn on and turn off - enables one to replace PEM
- Operate at high currents: 1 A/cm^2 at - 1.8-1.9 V -
- No need for precious metals

Long-Term Testing Results

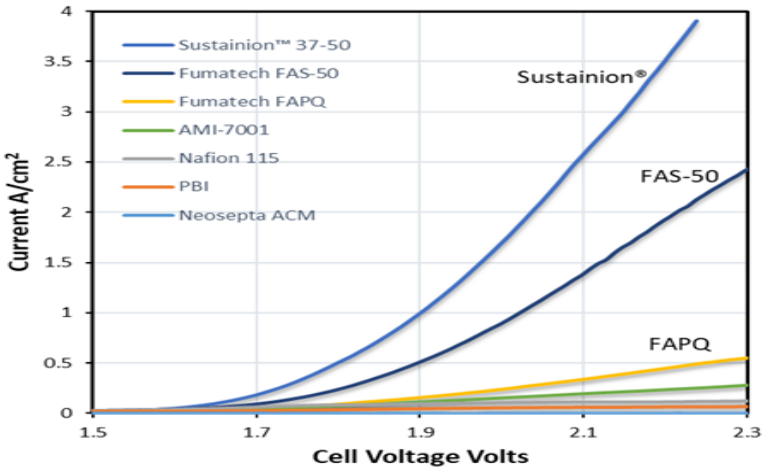


A constant current run (1000 mA/cm2) of a 60 °C alkaline water electrolyzer with a Sustainion® 37-50 membrane and a NiFeO4 anode catalyst and a NiFeCo cathode catalyst.

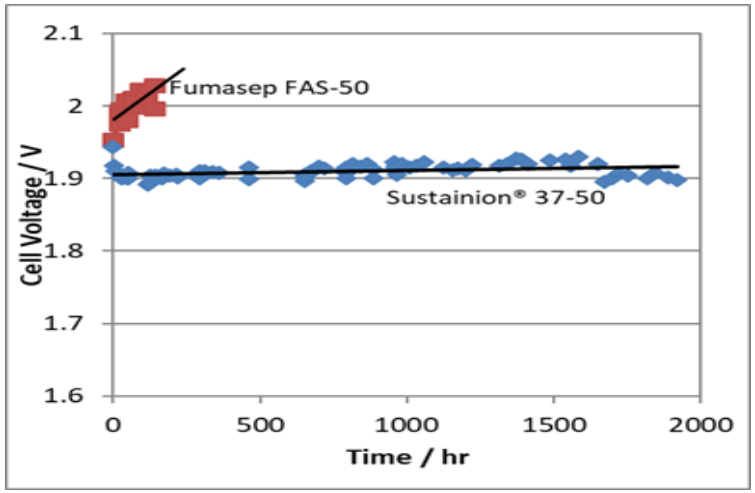


The steady state performance of the cell with the Dioxide Materials' catalyst at 1 A/cm².

The effect of changing the membrane: Dioxide Materials' Sustainion® Membranes Outperform The Competition.

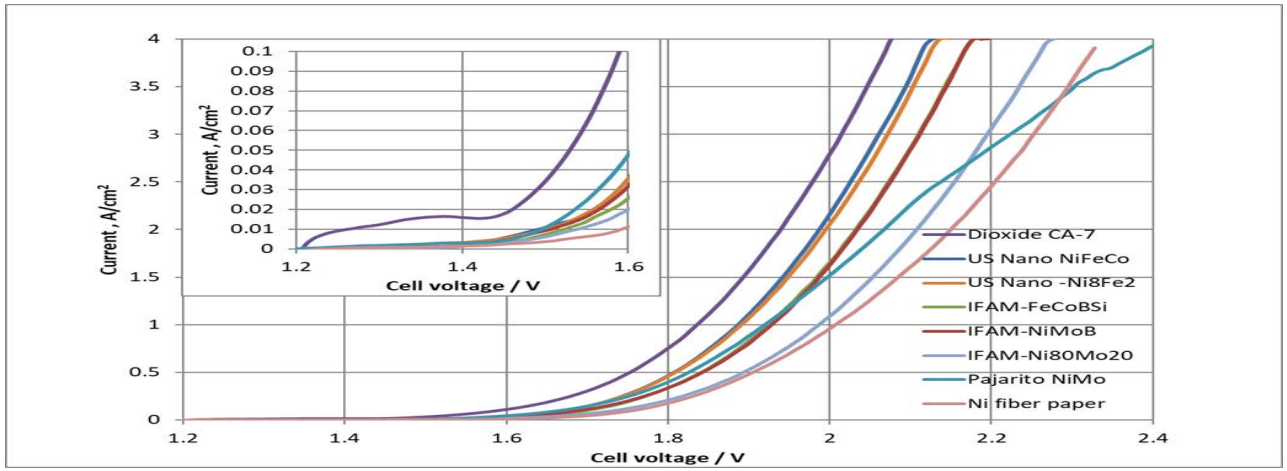


The effects of membrane on the linear sweep voltammogram taken with an alkaline water electrolyzer with a $FeNiO_4$ anode catalyst and a FeNiCo cathode catalyst in 1 M KOH at 60 °C .



The effect of membrane on an alkaline water electrolyzer with a $FeNiO_4$ anode catalyst and A FeNiCo cathode catalyst in 1 M KOH at 60 °C at a constant current of 1 A/cm². The fumasep membrane failed after 200 hours.

The effect of changing the catalyst: Dioxide Materials' Catalysts Offer Superior Performance.



Dioxide Materials™
The CO_2 Recycling Company™

This work is supported by DOE under ARPA-E contract DE-AR0000684