



Renewable Bio Hydrogen Production

Cooperative Research and Development Final Report

CRADA Number: CRD-17-660

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NOTICE

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In accordance with Requirements set forth in Article X: REPORTS AND PUBLICATIONS A.(2), of the CRADA agreement, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

Parties to the Agreement: Nzyme2HC

CRADA number: CRD-17-660

CRADA Title: Renewable Bio Hydrogen Production

Joint Work Statement Funding Table showing DOE commitment:

Estimated Costs	NREL Shared Resources a/k/a Government In-Kind
Year 1	\$\$80,000.00
TOTALS	\$\$80,000.00

Abstract of CRADA Work:

NREL researchers will work closely with Nzyme2HC to develop and evaluate a novel process for enzymatic production of renewable hydrogen to deliver a potentially high-yield and low-cost renewable biofuels.

Summary of Research Results:

NREL researchers conducted experiments to test the level of enzyme activity under different conditions of interest towards the use of industrial feedstocks in the future; such as pH of the medium, using added reduced methyl viologen (or other mediators) and bisulfates or sulfuric acid as sources of protons. The system that we focused on was based on the hydrogenase enzyme deposited directly on the surface of a carbon electrode that delivers current to it. A second system that we had proposed comprised of (b) the enzyme embedded in either a thin alginate film or alginate beads being reduced by a mediator (methyl viologen). The experiments provided data to evaluate the actual feasibility of the first process for commercial applications (Figures 1 and 2).

NREL researchers demonstrated, in principle, the feasibility of the approach.

Figure 1. Effect of the pH of the medium on H₂ production by a purified recombinant [FeFe]-hydrogenase deposited on a carbon felt electrode.

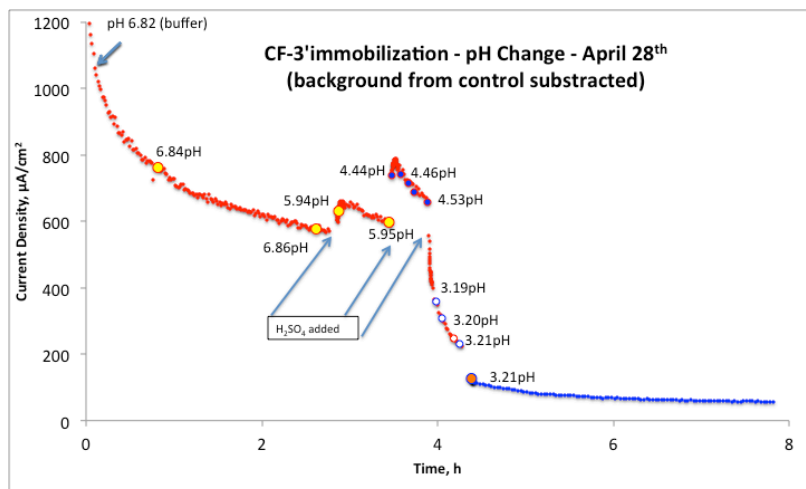
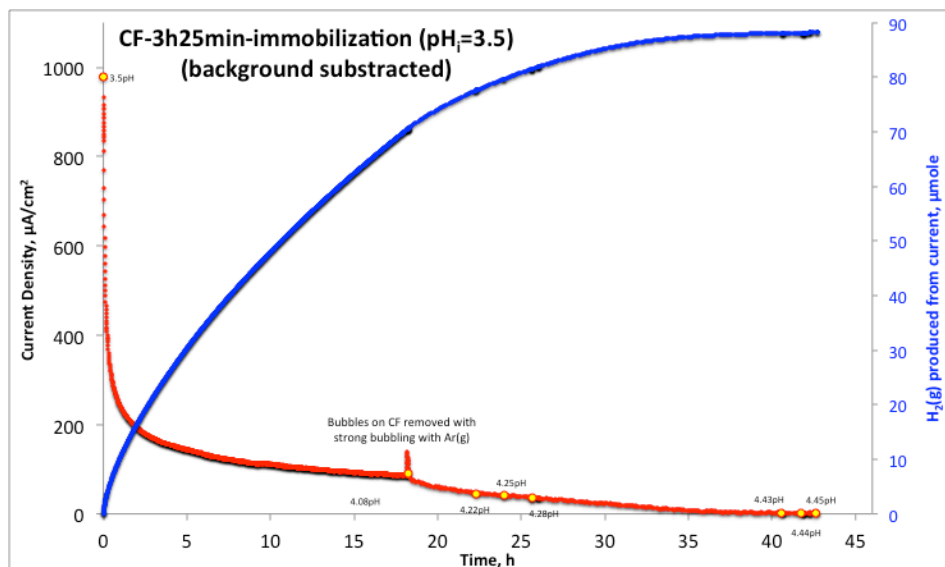


Figure 2. Hydrogen produced by a purified recombinant [FeFe]-hydrogenase deposited on a carbon felt electrode at an initial pH of 3.5.



Subject Inventions Listing:

U.S. Provisional Application No. 62/656,689, “In Vitro Production of Hydrogen Utilizing Hydrogenase” (NREL 17-19)

Report Date:

16 October 2017

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DOE Program Office:

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