II.E.6 Photobiological Hydrogen Production

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Objectives

- Cloning of Ni-Fe hydrogenase subunit genes
- Cloning of Ni-Fe hydrogenase assembly genes
- *E. coli* transformation
- Enzyme characterization
- Bioreactor studies of hydrogen production

Technical Barriers

This project addresses the following technical barriers from the Biological Hydrogen Production section (3.1.4.2.5) of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

(Y) Rate of hydrogen production
(Z) Continuity of photoproduction
(AA) Systems Engineering

Technical Targets

The key target of the proposed research is to advance the status of photobiological hydrogen production by developing NiFe-hydrogenase enzymes with enhanced tolerance to the presence of O_2 and expressing them in hosts such as *E. coli*.

Approach

NREL researchers have previously isolated a number of genes involved in the assembly and maturation of the *Rubrivivax gelatinosus* CBS hydrogenase. In collaboration with NREL, FIU researchers will subclone subunit and assembly CBS hydrogenase genes onto vectors with which they will transform *E.coli* cells to determine which genes are necessary for maximal hydrogenase enzyme activity. The enzyme will then be characterized, and hydrogen production will be conducted in bioreactor systems.

Accomplishments

The project was just initiated (July 2006) and there has been insufficient time to produce any results yet.