INTERNATIONAL NUCLEAR ENERGY RESEARCH INITIATIVE

Sulfur-Iodine Integrated Laboratory-Scale Experiment

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Abstract

The Nuclear Hydrogen Initiative (NHI) is investigating high-temperature thermochemical cycles for the production of hydrogen with nuclear energy. Thermochemical cycles use a series of chemical reactions to generate hydrogen and oxygen from water at lower temperatures than direct thermal dissociation. The sulfur-iodide (S-I) cycle is one of the leading candidates due to its technical maturity and its potential high efficiency.

The objective of this project is to evaluate the key technology issues associated with using the S-I cycle to produce hydrogen. Researchers will build on an earlier I-NERI project (2002-001-F) that developed the process chemistry and materials technology for each of the three major S-I reaction sections and investigated their operation as stand-alone units.

For this research project, the team will integrate the component reaction sections at a single location to perform a series of closed-loop laboratory-scale experiments. Results of the integrated laboratory-scale experiments will establish the technical basis to assess the viability of the S-I cycle for nuclear hydrogen production. In addition, the team will develop control systems for closed-loop operations, select interface components between sections, and create the safety documentation necessary to conduct the integrated laboratory-scale experiments.

Developing and demonstrating the S-I cycle will include the following sequence of activities:

1) Develop, construct, and test the individual laboratory-scale sections
2) Ship sections to the experiment site and assemble as an integrated, closed-loop system
3) Conduct integrated, laboratory-scale S-I experiments and analyze the results