

Electrochemical Apparatus with Disposable and Modifiable Parts

Applications:

- Electrochemical experiments in solution
- Electrochemical experiments on surfaces
- Bulk electrolysis experiments
 - Fuel cells
 - Corrosion studies
 - Academic
 - Labs
 - Teaching and research

Benefits:

- Incorporates disposable, commercially available cuvettes
- Modifiable design
- Allows multiple experiments using a single solution
- Designed for interface with other instruments
- A single cell can be used for multiple experiments

Contact:

Marcus A. Lucero
(505) 665-6569
marcus@lanl.gov
licensing@lanl.gov

Summary:

Who better than users to invent, or reinvent, laboratory equipment? Reinvention is just what two scientists at Los Alamos National Laboratory (LANL) did for standard electrochemical laboratory apparatus, which incorporate cells, or cuvettes, that hold micromilliliters of liquids.

Commercially available electrochemical laboratory apparatus are expensive. A quartz cell typically costs more than \$1000. Cells made from polytetrafluoroethylene or from an acrylic polymer may cost more than \$230 each. Those used for bulk electrolysis (\$800), for flow (\$850), and for general electrochemistry (\$20-\$200) are also too expensive to be considered disposable. High cost means that a laboratory, especially in academia, might be able to afford only a limited inventory, which could stall productivity. Too expensive to be disposable, the cells must be cleaned after each experiment, and as they are reused the chance of contamination from prior experiments is increased.

In addition to their high cost, most electrochemical apparatus lack the flexibility of being useful for both solution electrochemistry and surface electrochemistry. Furthermore, traditional electrochemical apparatus have limited capacity to interface with optical fibers, microscopes, spectrometers, and other instrumentation.

In response to these issues, LANL's scientists have developed a new test apparatus that is designed to be inexpensive, reconfigurable, and adaptable to both surface and solution electrochemical experiments. For example, the setup used disposable, commercially available, and very inexpensive, rectangular cuvettes instead of custom cells. Experimental setups can use holes in the caps for insertion of a reference electrode, a counter electrode, or as a gas inlet and outlet. Optional holes in the bottom and sides of the cuvettes can be used for electrical connections, tubing, or filtration. The same cell can be used for bulk electrolysis and surface electrochemical experiments.

The invention also includes electrochemical apparatus that can interface with optical instrumentation. If the working electrode is transparent, light from an optical fiber may be directed through the working electrode and into a cuvette. Light from inside the cuvette may then be transmitted back through the working electrode and back through the optical fiber or through an additional optical fiber to a spectrometer. The spectrometer analysis will provide information about the electrochemistry taking place inside the cuvette during an experiment.

Development Stage:

Working prototypes of all configurations of the electrochemical apparatus are now in use.

Technology Readiness Level: 8- Full system prototype tested in an operational environment

Patent Status:

Title:	ID Number:	Patent/App. Number:	Date:
Electrochemical Apparatus Comprising Modified Disposable Rectangular Cuvette	S-118,896	US Patent Application No. 12/916,085	10/29/10

Licensing Status:

Available for exclusive or non-exclusive licensing and collaborative agreements.

