

UNIVERSITY OF LOUISIANA AT LAFAYETTE

STEP Committee

Technology Fee Application

Introducing the Galvanostat for Electrolysis in Chemistry
Labs
Title

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Name of Submitter
(Faculty or Staff Only)

UL Department of Chemistry
Organization

Title: Introducing the Galvanostat for Electrolysis in Chemistry Labs

Date: 6/18/18

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ABSTRACT (250 words or less):

This is a request to purchase economical Galvanostat equipment for chemistry labs, at a cost of \$ 12,336.00. We are constructing advanced lab manuals for Analytical Chemistry/Instrumental Analysis labs with new experiments from scratch. Electrogravimetry is a crucially valuable technique in chemistry, which is routinely applied in areas as diverse as Organic, Analytical, Instrumental, Pharmaceutical, Environmental, and Biochemistry, as well as Forensic Science. Electrogravimetry is extensively used in teaching and research in the previously mentioned fields. Nowadays, too many universities replaced old electroplating techniques by modern techniques that are more efficient and consume less hazardous solvents. Students have to have their hands on more advanced techniques that have wide application in their future careers. When constructing the new lab manual, we are focusing on experiments that minimize the amount of hazardous chemicals used. We are asking for funding to purchase a clean and economic Galvanostat for Electrolysis in Chemistry Labs, which allows the use of small amounts of chemicals. This technique is compact and portable which permits its use in different chemistry labs.

a. Purpose of grant and impact to student body as a whole

This application is to request funding for the purchase of the economical Galvanostat equipment, which is needed for new experiment designed for Instrumental Analysis (CHEM 430G) and Analytical Chemistry (CHEM 222) classes and General Chemistry lab (CHEM 115). A new lab manual is constructed to replace the experiments that failed due to outdated instruments and other ones that use hazards materials such as polarography that uses mercury in analytical analysis. Briefly, in this experiment students will be introduced to a new Galvanostat instrument. This instrument is designed to perform electrogravimetry analysis for the determination of metal content including precious metals in ores environmental samples' solutions.

The instrument is equipped with two displays to monitor the power and potential of the cell. A third display is used to measure the time of polarization of the cell. The counter electrode at the center can run up to a maximum of 100 cycle per minute to provide the required stirring to maintain a highly uniform metal deposition on the platinum gauze cathode. The specific electronic circuitry allows the current set remaining constant, even with changes of the conductivity of the solution. The circuits are designed to work continuously and are well-protected against short circuits. The cabinet is ruggedly constructed of epoxy-painted steel and a polycarbonate film panel. This system minimizes the sample preparation and eliminates personal errors. It is compact and portable, which allows its use in Analytical Chemistry labs as well as Organic Chemistry and Biochemistry ones.

The requested system is ideally suited for teaching. Positive funding decision will enable us to deploy the requested equipment for students use in CHEM 430G (Instrumental Analysis a Lecture and Lab course required by American Chemical Society certified chemistry major students approx. 8-15 students/year). Students in this class can use it in an environmental chemistry experiment which is the determination of precious metals in ores environmental samples. Other applications include the determination of metal contaminations in food, and cosmetics experiment for CHEM 222 (Analytical Chemistry Lab approx. 35-44 students/year). Students will also use it to determine the amount of copper in a Penny. The same technique will be used for preparing all the unknowns for General Chemistry lab (CHEM 115, approx. 320-400 students/year).

Therefore, we strongly feel that it's important for our students to acquire hands-on training in this technique. The new technique also allows faster measurements, thereby accommodating rapidly increasing enrollments in our laboratories.

b. Projected lifetime of enhancement

The requested fund will pay for new, microscale experiment equipment, with a life expectancy 6-8 year. The requested system ships within 6 - 9 month with factory warranty. It is a simple system that can be used easily by students. Regular maintenance is anticipated for this type of equipment. Periodically, new electrodes will be purchased from departmental funding for continued operation.

c. Person(s) responsible for:

i. Implementation: Dr. Febee Louka

ii. Installation: Since the requested system is portable no installation is required. Dr. Febee Louka, and Dr. Hui Yan (Analytical Chemistry faculty) will jointly deploy the system for the Analytical laboratories, Drs. Thomas Junk and August Gallo will provide the setup and training for the Organic Chemistry laboratories. Dr. Wu Xu will deploy it for the Biochemistry lab.

iii. Maintenance: Dr. Febee Louka will periodically inspect the unit. There is no regular maintenance anticipated. If a component fails, Dr. Thomas Junk, Department Head, will make arrangements for repairs.

iv. Operation: The unit is designed to be operated by students (Education Kit).

v. Training: Chemistry faculty will provide training and demonstrations of proper operation to all students enrolled in their labs.

Budget Proposal

	Unit	# Requested	Total
1. Equipment	\$ 5,036.00	1	\$ 5,036.00
2. Software	\$ 0.00		\$ 0.00
3. Platinum Electrode	\$ 4,510.00	1	\$ 4,510.00
4. Helicoidall Electrode	\$ 0.00	1	\$ 2,790.00
5. Maintenance	\$ 0.00		\$ 0.00
6. Other	\$ 0.00		\$ 0.00
TOTAL:			\$ 12,336.00

d. Budget Narrative

Equipment:

GALVANOSTAT **\$ 5,036.00**

Software: is included with the purchase of the instrument at no extra charge.

Electrodes:

ELECTRODE PLATINUM GRID **\$ 4,510.00**

HELICOIDALL PLATINUM ELECTRODE **\$ 2,790.00**

Total **\$ 12,336.00**

Other: \$ 0.00

Previous STEP projects

Hui Yan and Febee Louka "Bring Rotary Evaporator for Sample Preparation to Analytical Chemistry Laboratory Courses", Fall 2017, \$8,700

Hui Yan and Febee Louka "Improving Precision and Accuracy in Analytical Chemistry Laboratory Courses", Fall 2016, \$5,137.72

Febee Louka "Economical Micro-scale Vacuum Assisted DigiFILTER Assembly in Chemistry Labs" Fall 2016. \$13,901.24

Febee Louka "Economical Micro scale Equipment in Chemistry Labs" Spring 2016 \$16,843.40