

UNIVERSITY OF LOUISIANA AT LAFAYETTE

STEP Committee

Technology Fee Application

**Economical Safe Separation of Chemical Components
in Environmental, Pharmaceutical, & Medical Samples
in the Chemistry Laboratories**

Title

Febbee Louka

Name of Submitter
(Faculty or Staff Only)

UL Department of Chemistry

Organization

Title: Economical Safe Separation of Chemical Components in Environmental, Pharmaceutical, & Medical Samples in the Chemistry Laboratories Date:07/12/2024

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ABSTRACT (250 words or less):

This is a request to purchase Thermo Scientific Small Benchtop Refrigerated Swinging Bucket Rotor Package for wide temperature range applications -10°C to +40°C for the chemistry labs, at a cost of \$11,691.00. In the last few years, we upgraded the lab manual for the **undergraduate Analytical Chemistry lab CHEM 222** (taught two or three semesters/year) and constructed a lab manual for **Instrumental Analysis CHEM 430G** (one semester/year) lab with new experiments from scratch. We introduced new microscale experiments as requested by the American Chemical Society (ACS). Separation of components of chemical samples is very crucial in chemistry labs, which is routinely applied in areas as diverse as Organic, Analytical, Instrumental, Pharmaceutical, Environmental, and Biochemistry, as well as Forensic Science. Purification and separation techniques are extensively used in teaching and research in the previously mentioned fields. Nowadays, too many universities are switching to techniques that do not require long contact with chemicals using different techniques that are more efficient and consume less hazardous solvents. Students must have their hands on wide range of applications in their future careers. When constructing the new lab manuals, we are focusing on experiments that minimize direct contact with the chemicals used. We are asking for funding to purchase a clean, safe, and economic separation of chemical components in the chemistry labs, which allows the use of small amounts of chemicals. This technique will help with enhancing the students' experimental skills, the equipment is cheap, applicable over a wide range of temperature, reliable, portable, easy to manage and can be used in the organic chemistry teaching (**CHEM 332/334**) laboratories, the inorganic (**CHEM 252**) labs as well as the biochemistry teaching labs (**CHEM 319**).

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

This application is to request funding for the purchase of the equipment needed for new experiments in Instrumental Analysis and Analytical Chemistry classes. A new lab manual constructed for Analytical Chemistry/Instrumental Analysis labs with new experiments from scratch replacing experiments that failed due to outdated instruments and other ones that use hazardous materials such as polarography that uses mercury in analytical analysis.

The extraction and separation of solid chemicals from liquid ones are dominant techniques in environmental, pharmaceutical, food, petroleum, organic and biochemical analysis. Centrifuging has advantages over other methods; it is designed toward cleaner and more economical chemistry by using micro scale experiments, which allows the use of small amounts of chemicals. In this method conical plastic or Teflon containers are used which are not breakable like the glass ones used in comparable experiments. This system is compact and portable which allows its use in Analytical Chemistry labs as well as Organic Chemistry, Inorganic Chemistry and Biochemistry ones.

In contrast to other techniques, which are designed for research, the requested equipment is 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 pharmaceutical experiments which is determination of calcium in a dietary supplement tablet and determination of iron in vitamin tablets. Another application is a food, or cosmetics experiment for CHEM 222 (Analytical Chemistry Lab approx. 35-44 students/year). The Organic Chemistry students can use it in synthesis of surfactants, which can be used in drug delivery for cancer cells and minimizing pollutants, CHEM 233 and/or 234 (Organic Chemistry Labs I and/or II, over 230 students/year). A Biochemistry experiment that can be taught for CHEM 319 (Biochemistry Lab, ~ 14 students/year) for cell cultures. Inorganic Chemistry can use it in the determination of cations of group I – III and anions in CHEM 252 (Inorganic Lab, ~ 20-24 students/year)

Therefore, we strongly feel that it is important for our students to acquire hands-on training in this technique. The Chemistry Department used to have four units of this equipment in the biochemistry labs, three of them failed to work in fall 2017 semester. The requested equipment speeds up experimental work, thereby accommodating rapidly increasing enrollments in our laboratories.

b. Projected lifetime of enhancement

The requested fund will pay for the new separation systems for diverse types of applications under a wide range of temperatures, with a life expectancy of 6-8 years. The

requested systems ship within 6 - 9 months with factory warranty. It is a simple system that can be used easily by students. Any regular maintenance is anticipated for this type of equipment. Periodically, new sample vials 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, will 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 and Dr. Salah Massoud for the Inorganic lab.

iii. Maintenance: Dr. Febee Louka will periodically inspect the equipment and there is a Unity Lab Services Total Care included in the package.

iv. Operation: The units are designed to be operated by students.

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	\$11,170.00	1	\$11,170.00
2. Software	\$0.00		\$0.00
3. Supplies	\$0.00		\$0.00
4. Maintenance	\$521.00	1	\$521.00
5. Personnel	\$0.00		\$0.00
6. Other	\$0.00		\$0.00
TOTAL:			\$ 11,691.00

d. Budget Narrative

Equipment:

Sorvall ST 8 Centrifuge, Refrigerated: TX-150 **\$11,170.00**
Swinging Bucket Rotor, Round Buckets (Set of Four),
ClickSeal Biocontainment Lids (Set of Four),
Adapters for 16 x 10/15/14mL tubes (Set of Four),
Adapters for 24 x 5/7mL tubes (Set of Four)

Maintenance:

Unity Lab Services Total Care **\$521.00**

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

Supplies: \$0.00

Other: \$0.00

Previously Funded STEP Grants:

Febbe Louka (PI) "Economical Micro scale Equipment in Chemistry Labs" Spring 2016
\$16,843.40

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

Febbe Louka (Co-PI) "Improving Precision and Accuracy in Analytical Chemistry Laboratory
Courses" Fall 2016, \$5,137.72

Febbe Louka (CO-PI) "Bringing Rotary Evaporator for Sample Preparation to Analytical
Chemistry Laboratory Courses," Fall 2017, \$8,700

All the above funded STEP grants allowed us to add new experiments to the teaching chemistry labs and introduce new techniques for students to learn. Students' skills have been improving over the years, which makes them more competitive when applying for good jobs and/or graduate studies.