

Opportunity Title: Colloidal Lubricant Systems for Fuel Economy and Durability of Mechanical Components

Opportunity Reference Code: DOE-MSIPP-16-12-ANL

Organization U.S. Department of Energy (DOE)

Reference Code DOE-MSIPP-16-12-ANL

How to Apply A complete application must include the following to be considered:

- Completion of all required fields in the application
- Undergraduate transcripts
- One Recommendation (minimum)

If you have questions, send an email to Elizabeth Nelson at Elizabeth.Nelson@orau.org . Please include the reference code for this opportunity in your email.

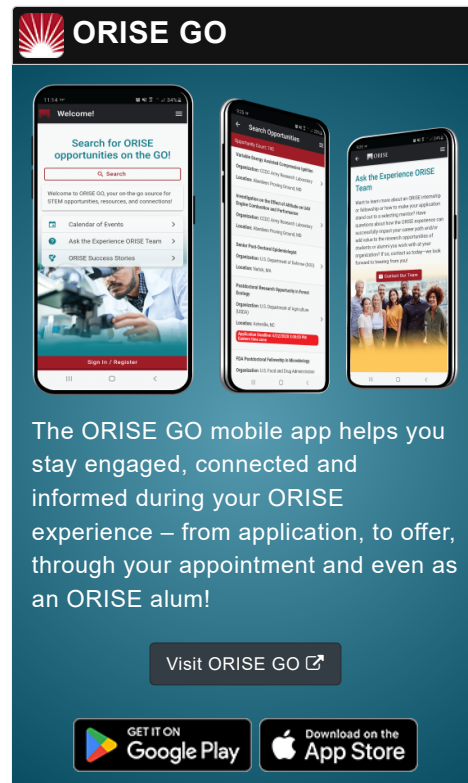
Application Deadline 3/16/2016 11:59:00 PM Eastern Time Zone

Description The Minority Serving Institutions Partnership Program (MSIPP) Internships is a new program to promote the education and development of the next generation workforce in critical science, engineering, technology, and math (STEM) related disciplines that complement current and future missions of DOE national laboratories. The MSIPP Internship program is designed to provide an enhanced training environment for next generation scientists and engineers by exposing them to research challenges unique to our industry.

MSIPP Interns will be given the opportunity to complete Summer Internships aligned with ongoing U.S. Department of Energy Office of Environmental Management (DOE-EM) research under the direction of a host national laboratory. The internship will be performed at the host national laboratory, utilizing their facilities and equipment under the guidance of a research staff member.

Minority Serving Institutions are institutions of higher education enrolling populations with significant percentages of undergraduate minority students.

This project consist of testing of colloidal lubricants for energy reduction and wear protection. This type of lubricants are formulated with encapsulated nano-particles dispersed in a base fluid. The chemistry of the encapsulation, as well as the size, nature and concentration of nanoparticles will have an effect in performance of these lubricants. This new lubricant technology is being considered as a more environmentally friendly alternative of current lubricant chemistry. A conventional lubricant is formulated with a variety of additives with different tribological performance attributes. The most relevant ones are friction modifiers (FM) additives to reduce friction and hence minimize parasitic energy losses (which translate into improved fuel economy), and antiwear (AW) additives, in order to reduce wear in moving components and hence protect the surfaces from

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damage (which translate into durable components and systems). A selection of new technology lubricants based in colloidal fluids will be studied as a replacement for conventional FM and AW additives.

A variety of nano-particles, used in the colloidal lubricant systems, will be tested on boundary conditions using tribological ball-on-flat contacts under reciprocating sliding, similar to the conditions operating in an engine, or under extreme pressure condition using 4 ball contact configuration. The student will assist in preparing lubricant samples and tribological testing for the project. The candidate will also set up and run computer data acquisition. The candidate will process and graph the data using Excel or Kaleidagraph. The test specimens will also be characterized by one or more of the following: optical profilometry, micro-indentation, viscometry, particle size analysis, and optical micrograph. The candidate will also work in the preparation of scientific reports and how to prepare and give a talk/ presentation about this project.

Tribology is the branch of engineering that deals with friction and wear of materials. The candidate will work with members of the Tribology Section in an experimental setting to investigate the tribological properties of materials and lubricants. Topics under research in our section includes: reduction in parasitic losses in engines, gears for wind turbines, studies of chemical boundary films, nanoparticles for lubrication enhancement, and use of hard coating for wear protection, areas in which the candidate will be exposed to further learning.

Qualifications The successful student should know the basics of how to operate office: word, power point and excel. Additional skills in the materials characterization (microscopes and profilometers/ topography) and previous skills in operating laboratory equipments will be preferred. The candidates need a science background, if possible in engineering, material science, physics or chemistry. Best match will be mechanical or materials engineering. Any laboratory or research experience will be a valuable skill.

Eligibility Requirements:

1. Be currently enrolled as a full-time undergraduate or graduate student at an accredited Minority Serving Institution *see criteria for Minority Serving Institutions here <http://srml.doe.gov/msipp/internships.htm>
2. Be working towards a science, technology, engineering, or mathematics (STEM) degree
3. Have an undergraduate cumulative minimum Grade Point Average (GPA) of 3.0 on a 4.0 scale
4. Be a United States citizen
5. Pass a drug test upon selection to participate in the MSIPP

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*The process and timing for drug testing varies from lab to lab. Use of Marijuana/Cannabis or its derivatives if prescribed is legal in some states. However, having these drugs in your system is NOT legal at United States Federal Contractor sites and National Laboratories.

6. Reference must be received by March 6, 2016 at 11:59 PM ET

For more information about The Minority Serving Institutions Partnership Program (MSIPP) Internships, please visit <http://srnl.doe.gov/msipp/internships.htm>

To see all MSIPP position postings visit:
www.orise.orau.gov/MSIPP

**Eligibility
Requirements**

- **Citizenship:** U.S. Citizen Only
- **Degree:** Bachelor's Degree or Master's Degree.
- **Overall GPA:** 3.00
- **Discipline(s):**
 - **Chemistry and Materials Sciences** (12 )
 - **Computer, Information, and Data Sciences** (16 )
 - **Earth and Geosciences** (21 )
 - **Engineering** (27 )
 - **Environmental and Marine Sciences** (14 )
 - **Life Health and Medical Sciences** (45 )
 - **Mathematics and Statistics** (10 )
 - **Physics** (16 )
 - **Science & Engineering-related** (1 )

Affirmation I certify that I am pursuing or have completed coursework towards a degree in science, technology, engineering, mathematics, or a related field.