OKLAHOMA
EPSCoR
UPDATE
Promoting Innovative Research

S³OK Project Awards Three REUs for Summer 2023

The Oklahoma NSF EPSCoR program through the NSF EPSCoR Research Infrastructure Improvement Track-1 project "Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience in Oklahoma (S3OK)" awards three Research Experience for Undergraduates (REUs) for summer 2023. The REU awards aimed to engage and train a diverse and skilled workforce to help fill Oklahoma's STEM careers. REUs also provide opportunities for undergraduate students from across the state to perform research at an Oklahoma higher education institution during the summer months. Students will gain improved science identity through guidance from faculty mentors and will increase STEM skills and knowledge via hands-on research experiences. Each REU award will receive up to $5,000 that will be used for student stipend, laboratory supplies, or research-related travel.

The 2023 REU awardees are:
Student: *Pedro Antonio*
Faculty Mentor: *Dr. Srinivas S. Kolla (Oklahoma State University, OSU)*

Produced Water Separation using Improved Liquid-liquid Cylindrical Cyclone Separators
This project aims to improve the design of Liquid-Liquid Cylindrical Cyclone (LLCC) Compact Separator performance for the effective cleaning of produced water with low quantities of oil. Pedro Antonio (student) will be introduced to the concept of multiphase flow and centrifugal separator technology that is used for enhanced separation of oil and water. The student will learn to build a new tangential inlet section and liquid outlet section, which are critical parts for the separation efficiency of the separator, using 3-D printing technology. This research experience will benefit the student in understanding the new technologies of 3D printing and determine the effects of the design in the experimental conditions giving them a clearer understanding of the physics.

Student: Abby Oakes
Faculty Mentor: Dr. Srinivas S. Kolla (OSU)

Numerical Modeling of Vortex Dynamics in Liquid-Liquid Cylindrical Cyclone Separators
The overall goal of this project is to model the vortex dynamics that are critical for oil-water separation of produced water in an LLCC Compact Separator with the produced water entering the setup through a tangential inlet. Abby Oakes (student) will be introduced to the concept of numerical modeling such as Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA) using tools such as ANSYS. The student will mainly determine the optimal meshing configuration, determine the optimal turbulence model to use for the flow and vortex dynamics, and test various configurations for optimal vortex stability and oil separation. This research experience will help prepare the student for graduate studies and industrial work.

Student: Sean Smart
Faculty Mentor: Dr. Hong Je Cho (OSU)

Aqueous Nitrate Removal by Virtue of Spent Coffee Ground-Derived Porous Carbon
This project aims to develop spent coffee grounds (SCG)-derived carbon adsorbents capable of effectively removing aqueous nitrate through adsorption processes. The project will have immediate and direct impacts on the development of effective carbon adsorbents derived from SCG as sustainable carbon precursors for nitrate removal. This research will provide a better understanding of the synthesis of carbon via metal-catalyzed pyrolysis of SCG, but also insights into the effect of metals on the porous structure of carbon as well as nitrate adsorption capacity. Sean Smart (student) will gain knowledge and skills to solve aqueous nitrate contamination issues. The student will be exposed to cutting-edge technologies and new ideas to tackle the scientific challenges. Since the student wants to pursue a research career in industry or academia after graduation, the research experience gained from the project will provide him opportunities to develop problem-solving, logical thinking, communication and time management skills that will be beneficial for his future career.