CHEMICAL ENGINEERING
COLLEGE OF ENGINEERING AND APPLIED SCIENCES

FOR APPLICATION YEAR: 2026

PROJECT TITLE: Design and development of low-cost rheological tools

Benjamin Yavitt
Chemical Engineering
858 Mantei Center
Cincinnati OH, 45221
yavittbn@ucmail.uc.edu
Phone: 513-556-9840

Aashish Priye
Chemical Engineering
Cincinnati OH, 45221

Project Description

Rheology is the study of flow and deformation of matter. While the scientific term may be unfamiliar to the public, the principles of rheology are widespread in daily life. For example, squeezing toothpaste from a tube relies on careful design of the toothpaste viscosity and the applied pressure. Accessing reliable quantitative information on rheological properties (such as viscosity, yield stress, or relaxation time) can be prohibitive due to the high costs and limited accessibility of commercial instruments. Our group recently demonstrated a “do-it-yourself” (DIY) viscometer using 3D printing and off-the-shelf electronic components that allows anyone to conduct their own rheology experiments for less than $100. The summer project seeks to expand the platform to design, build, and share more DIY instrumentation. Our objective is to modify the original design to improve the capability, sensitivity, and cost. The next generation viscometer will increase accessibility to rheology concepts in educational and community settings.

The research will be conducted in the RheOhio Lab (Department of Chemical and Environmental Engineering). The UPRISE student will be working alongside the faculty mentor (Prof. Yavitt) and other student members of the lab. The project is in collaboration with Prof. Aashish Priye (Department of Chemical and Environmental Engineering) who will help with fabrication and testing. Day-to-day activities involve in-lab, hands-on work designing, prototyping and testing the next generation viscometer. Students should be comfortable in computer aided design (CAD) and have interests in 3D printing and electronics. Training in all three of these activities will be provided by lab members. The UPRISE student will learn and apply rheological concepts and principles using the new device. In addition to engineering work, the UPRISE student will also participate in an outreach project to manage an online GitHub page to freely share designs and instructions for the DIY viscometers.

This will lay a foundation to engage the instrument platform to K-12 communities, such as classrooms within the Cincinnati Public School system.