ANALYTICAL RESOURCES CORE

COLORADO STATE UNIVERSITY

ARC MONTHLY BULLETIN

MARCH 2023

Welcome to the ARC Bulletin, a monthly newsletter to keep you informed about the latest happenings in the ARC. Here you will find information about our team, job opportunities, equipment and facilities, upcoming seminars, and other exciting news!

DID YOU KNOW?

Every year, the ARC hosts a demonstration and outreach event for 7th and 8th grade students from Fort Collins Lincoln middle school enrolled in the national AVID program. The Advancement Via Individual Determination (AVID) program is a non-profit organization that provides professional learning to close opportunity gaps and improve college and career readiness for middle and high school students, especially those traditionally underrepresented in higher education.

We are excited to work with our 3rd AVID cohort on Thursday March 6. These activities are some of the educational highlights here in the ARC by directly impacting these young learners as they start thinking about their college opportunities.

ARC IN THE NEWS

Longtime external customer of the ARC, New Iridium, has been a steady user of our NMR facility since 2019. Their research staff has been trained to independently operate our NMR spectrometers to enable immediate data collection critical to move their synthetic process forward. New Iridium's photosynthesis-inspired photocatalysis technology was featured in a short film by RE:TV, and includes some footage of their NMR use in the ARC.

https://www.re-tv.org/articles/reactivating-chemicals

ANNOUNCING THE NEW TOF-U!

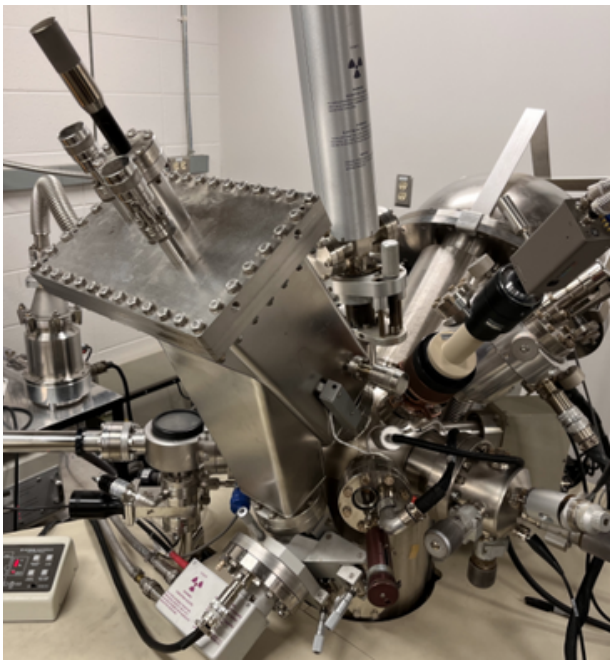
We are excited to announce the installation of an Agilent 6545 Q-TOF LCMS system (the 'TOF-U'). This state-of-the-art instrument is designed to provide high performance and reliable analysis of both pure and complex samples for a wide range of material, environmental and life science applications. With picogram sensitivity, high mass resolving power (45K), sub ppm mass accuracy and available mass ranges from 100 to 10,000 m/z, researchers will see improvements in data quality from our retiring Agilent 6230 TOF system (the 'B-TOF') while maintaining consistency in instrument operation and data processing platforms. The B-TOF will no longer be available starting March 3. Full specifications for the Agilent 6545 system can be found here.

SCAN ME!

Core staff will be available to offer familiarization and an introduction to enhanced capabilities for existing users as well as training for new users. Installation will begin the week of March 6 and we expect that the system will be operational and available to users beginning April 3. We will have a Q&A session during our upcoming Mass Spec User Group Meeting in April and invite you to come and explore the possibilities of the Agilent 6545 TOF-U system to support your research.

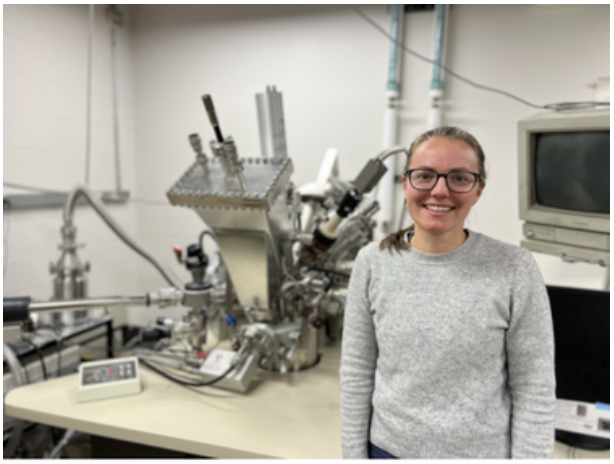
MEET THE INSTRUMENT AND EXPERT

Our XPS (X-ray Photoelectron Spectroscopy) is our go-to surface analysis instrument. The kinetic energies of photoelectrons escaping the top ~10 nanometers of dry, solid samples, after irradiating the surface with a beam of X-rays, are measured to identify the chemical composition and chemical states of the sample surface. Our XPS features an electron neutralizer to combat sample charging, an Ar ion gun for additional neutralization and sputtering (cleaning or depth profiling), and a UV source for UV photoelectron spectroscopy (UPS). The XPS is used in the research areas of ultra-thin and nanostructured coatings for biomedical applications, energy conversion and storage, semiconductor interfaces and material properties, and electrochemical sensors, among others.



Meet XPS Expert Rebecca Miller

Dr. Rebecca Miller manages training, full service, maintenance, and education for the XPS, other surface science instruments (profilometer, ellipsometer, contact angle goniometer), the scanning electron microscope (SEM), and EM sample preparation equipment in the ARC. She has 2.5 years of experience in the ARC, and previously, she carried out her doctoral work in the Prieto research group at CSU on inorganic nanoparticle synthesis and characterization.



USER FOCUS GROUPS

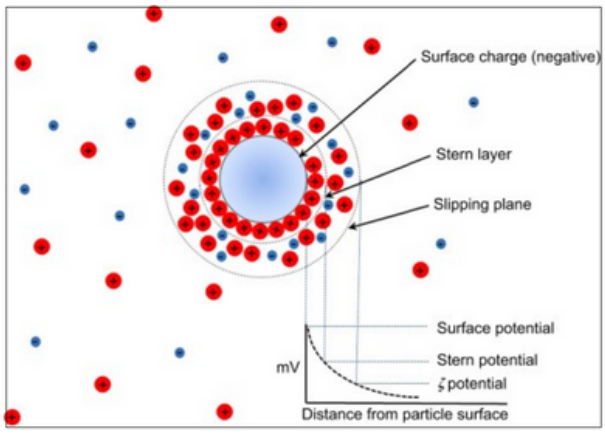
March 6 – XRD User Focus Group (with Brian Newell)

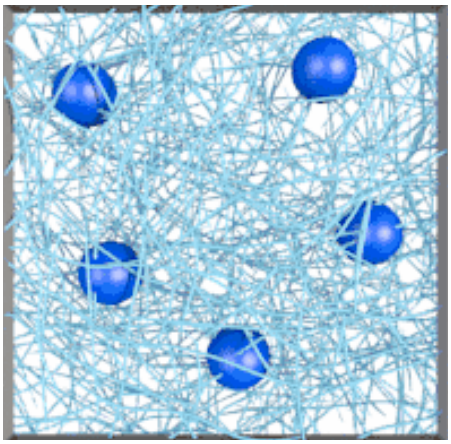
April 17 – Self-use Mass Spec Focus Group (with Claudia Boot)

May 15 - NMR User Focus Group (with Michele Mailhot)

Our User Focus Group meetings provide ARC users an opportunity to learn about the latest operational changes or added capabilities in the different ARC labs, and any upcoming training workshops and seminars. They are meant to provide users a safe and welcoming forum to ask questions, bring up any issues, concerns or development needs, provide suggestions for new directions, or suggest topics for future summer schools or seminars to advance their research and professional development. Meetings will be held quarterly but also ad-hoc when critical information needs to be shared with the user group. Invitations are sent directly to our instrument chat groups in our ARC User Team (MS Teams).

UPCOMING EDUCATIONAL OPPORTUNITIES





April 19 – Dr. Ana Morfesis (Malvern Panalytical). Zeta potential and micro-rheology measurements using light scattering techniques.

Learn how to use dynamic light scattering in the ARC to determine the surface charge of nanoparticles, assess the stability of a colloidal system, or extract the local and bulk rheological properties of a matrix. Microrheology offers significant measurement advantages for low viscosity, weakly-structured complex fluids since it offers a much wider frequency range than conventional mechanical rheometry, and can access the very high frequencies required to measure the critical (short timescale) dynamics of such low viscosity materials. DLS Microrheology also requires very small sample volumes - microliter-scale volumes are possible - and enables rheological characterization of material types not available in larger volumes e.g. protein-based formulations.

www.research.colostate.edu/arc/arc-seminar-series

UPCOMING SUMMER SCHOOLS

- **Diffraction workshop –** Learn different methods of identifying and refining twinned X-ray and electron diffraction.
- **Advanced MALDI-TOF/TOF applications workshop** – Learn to optimize your methods and use various software data processing tools to measure challenging synthetic and bio-polymer samples by MALDI-TOF/TOF.

TEAM UPDATES

Welcome, Bradley Guilliams!

Bradley is a 3rd year PhD candidate in the Ackerson research group developing and integrating next-generation contrast tools in cryo-electron microscopy. He joined the ARC in February 2023 as a part-time Graduate Research Assistant learning from and working closely with ARC TEM expert Dr. Roy Geiss. Bradley will assist Roy with TEM full service work, but he also brings unique skills to the ARC around biological electron microscopy and will be providing user training around biological sample preparation for electron microscopy.
Bradley participated in the recent JEOL SerialEM training to enable new types of experiments on our 2100F TEM including single particle analysis, electron tomography, and microcrystal electron diffraction. These techniques enable structural determination for both biological and materials applications.

WE ARE HIRING!

ARC will be hiring an entry-level Research Associate to help with metabolomics and proteomics mass spectrometry sample preparation, including the operation of the Labman Robot. If you have an interest in joining a highly supportive and collaborative team, looking to develop some valuable mass spectrometry skills and contribute to incredibly interesting and diverse metabolomics research, please contact Corey.Broeckling@colostate.edu.

OTHER UPDATES AND REMINDERS

- Thank you all for starting to acknowledge the ARC by our **RRID: SCR_021758.** 24 publications on GoogleScholar since 2022!
- Submit your favorite EM images by April 1st, 2023, to have a chance to win our EM imaging contest: ***https://forms.office.com/r/q1gLgTu1Sg***
- Check out our growing library of seminar recordings and educational lectures on our ARC seminar webpage. If you plan to use any of these in your classes, please make sure to notify and acknowledge the ARC.

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