

**AGeS2 Student Geochronology Research and Training Program Laboratory
Overview
University of Kansas LA-ICPMS Laboratory
2/3/20**

Lab Description

The University of Kansas laser ablation (LA)-ICPMS laboratory under the supervision of [Dr. Möller](#) consists of a Thermo Scientific [ELEMENT 2](#) high resolution sector-field ICP-MS coupled with an [ANALYTE.G2](#) excimer laser with 193nm wavelength and 5ns pulse length. Routine laser applications are U-Pb geochronology of zircon, rutile, titanite, monazite (and apatite), as well as trace element analyses in a range of minerals and glasses (e.g. REE, Ti, Zr, Y, etc.). Solution work can be carried out for trace element concentrations or isotope ratios with an Elemental Scientific E2 autosampler system. See: geo.ku.edu/high-resolution-sector-field-icp-ms-laboratory.

Expected Time Frame

Visiting students should expect to spend a minimum of one week visiting our lab for data collection and interpretation. Depending on the project students can expect to analyze 1 – 5 samples/day (e.g. high-n detrital mineral projects 1/day, "simple" magmatic samples 5/day). Visiting students will be trained on the laser to create their own analysis list, choosing spot sites and focusing etc (see below). The actual time it will take to analyze the samples depends on several factors, including the number of spots required for the project goals (typically 120 spots for detrital samples and 40-50 spots for igneous / metamorphic samples), the quality of the preparation of images and also the experience of the user.

The student will learn and perform these basic steps during and after the visit:

- Petrography: Identify appropriate minerals using a binocular and/or petrographic microscope (preferably done prior to visit).
- Mount and image minerals using appropriate techniques (preferably done prior to visit).
(Note: we currently do not have a cathodoluminescence or BSE facility at KU)
- Set up run to analyze samples, including setting the spots on the laser.
- Tune instrument and run standards
- Check sample status during analysis.
- Reduce data, calculate isotopic ratios, ages and elemental abundances.
- Interpret data.

Analytical Costs

Students should budget \$1417.50/day for U-Pb or trace element laser analyses. Necessary analysis time vary depending on the project goals, but for budgeting purposes students can calculate a minimum of 3 samples/day for typical detrital (n=120) and 5 samples/day for typical magmatic samples (crystallization age only). This price includes all consumables, supplies, and training related to use of LA-ICPMS facility. They do not include use of mineral separation facilities at KU.

Preparation for Visit

Students should arrive at KU with uncoated standard size (≤ 27 mm wide) high-quality polished thin sections, grains mounted in polished 1" (or 25mm) epoxy resin discs and/or

grains mounted on adhesive tape on an epoxy disc (for the latter, contact us before you do this). Locations of all grains should be marked on a digital image of the mount or thin section (e.g. imported in Powerpoint). Be prepared to print to 4x times the size of a page. Each target grain in a thin section should be shown in an overview image and a zoomed-in image to show just the target grain and the immediate surroundings. This helps with orientation on thin sections, critical for monazite and apatite, not absolutely critical for zircon, titanite, and rutile because of their high reflectivity.

Zircon grains should be imaged with cathodoluminescence CL; for planning purposes of analysis locations, plan for a typical spot size of 20 microns. Monazite grains should be imaged with BSE and x-rays to produce maps of Y, Ca, Nd, Si, Th, U; for planning purposes, a typical spot size is 10-12 microns. Titanite and rutile grains should be imaged with BSE and/or x-rays (e.g., Zr, Al, Th, U), typical spot sizes for these can vary considerably depending on rock type, 20-50 microns. For more information on sample preparation contact Andreas Möller (amoller@ku.edu).

Students who do not have access to mineral separation or sample preparation facilities should contact either a commercial vendor or alternatively, it may also be possible to use the mineral separation facilities and mounting / polishing facilities at KU. For mineral separation, students need to contact our lab well in advance (weeks ahead), for mounting and polishing in epoxy mounts students should arrive at least 72 hrs prior to their scheduled instrument time to allow sufficient time for sample preparation. Preparation of thin sections can also be arranged at KU geology, please inquire with Pike Holman (plholman@ku.edu) about prices, availability and preparation time needed. Thin section should be done well in advance to give ample time for petrographic study and detailed imaging to guarantee effective use of time on the LA-ICPMS

Relevant Laboratory Staff

The KU LA-ICP-MS laboratory is directed by Professor Andreas Möller (amoller@ku.edu) and Dr. Joe Andrew (kylander@geol.ucsb.edu). Möller and Andrew will be primarily in charge of the visiting students, and will direct their training, sample preparation, analysis, data reduction, and data interpretation, with possible assistance of a KU graduate student assistant.

Data Processing and Interpretation

The visiting students will learn how to process and reduce all the data they have collected. This will include calculation of isotopic ratios and ages, trace element concentrations and the propagation of uncertainties. Möller will continue to be available after the visit to consult with the students through email or videoconference calls until they are satisfied that they understand the results.

Expected Lab Availability

Visiting students should schedule their visit at least 6-8 weeks in advance. Potential users should get in contact with us as soon as possible to ensure availability and work out all necessary steps in preparation of the visit.

Contact

Andreas Möller (amoller@ku.edu)