



Yin Lab (Isotope Geochemistry and Geochronology and Cosmochemistry Lab) at University of California, Davis

Lab Description: The Yin Lab at UC Davis hosts facilities for in-situ and solution isotope analyses. The main focus of the laboratory is chronology, which include U-Pb, Rb-Sr, Lu-Hf and the short-lived systems Al-Mg and Mn-Cr, and non-traditional stable isotope fractionation of heavy metals (Li-U).

The laboratory hosts a suite of mass spectrometers, including: (1) a Thermo Scientific *Element XR* high resolution inductively coupled plasma mass spectrometer (HR-ICP-MS), (2) a Thermo Scientific *Neptune Plus* multi-collector ICP-MS, and (3) a Thermo Scientific *Triton Plus* thermal ionization mass spectrometer. The laboratory also contains a recently upgraded Teledyne 193 nm excimer laser *Analyte Excite* for in-situ laser ablation analyses. The laser is equipped with a Helix sample cell, which allows for samples in the form of grain mounts, thin sections, or rock slabs. There is also a Class 100/10 PicoTrace Clean Lab facility available for sample preparation and chemical separation for U-Pb, Mg, Cr, Ti, and many more.

The Teledyne laser ablation system, *Analyte Excite*, can be coupled with the Thermo Element XR HR-ICP-MS and/or Thermo *Neptune Plus* (MC-ICP-MS) for in-site analyses of U-Pb ages, trace elements, or Hf isotopes (LA-ICP-MS) on zircons and other suitable minerals.

The laboratory can process single grain zircons for chemical abrasion isotope dilution thermal ionization mass spectrometry (CA-ID-TIMS) that were previously analyzed by laser ablation ICP-MS with *EarthTime* spike and other double Pb and double U spike calibrated against *EarthTime* Standards. The lab has all the facilities needed to anneal, leach, and dissolve zircons and perform chemical separations of U and Pb. Other minerals that we have experience with for U-Pb chronology include monazite, titanite, cassiterite and rutiles. Please inquire, if you are interested in different minerals or other isotopic systems.

Time Frame: For LA-ICP-MS for detrital zircon analyses, the student should plan for 4 days to prepare grain mounts for analyses, if this is not prepared prior to the visit (picking, casting mount, polishing and imaging). About two samples (with circa 100 grains each sample) can be analysed per day with LA-ICP-MS (*Analyte Excite* interfaced with *Element XR* magnetic section high-resolution dual collection (Faraday vs. SEM ion counting) and one day for data reduction, visualization and interpretation.

For CA-ID-TIMS, samples will need to be high-temperature annealed (2 days), best grains identified via LA-ICP-MS screening (1 day), leached (1 day), washed (2 days), dissolved (2 days), chemical separation (2 days), mass spectrometry analyses 5 days. A minimum of 16 days is required for CA-ID-TIMS analyses. Two samples of eight single zircon grains can be processed at the same time.

Analytical Costs: For LA-ICP-MS, the student should budget \$942 for a first day (includes training) and \$538 for subsequent days. For imaging of zircons prior to analyses, \$48/hr should be budgeted. For CA-ID-TIMS, the student should budget \$2,487 per sample. Prices for our analytical services are published here (<https://yinlab.faculty.ucdavis.edu/instrumentation-rates-for-outside-projects/>)

Preparation for Visit: The student should have mineral separates prepared prior to arrival at UC Davis. In the case of LA-ICP-MS of zircons, it is advantageous to have a grain mount prepared, polished and ideally, imaged by cathodoluminescence (CL) imaging, prior to arrival.

Relevant Laboratory Staff: The laboratory is directed by Professor Qing-zhu Yin (qyin@ucdavis.edu) and daily operations are facilitated by Dr. Matthew Sanborn (mesanborn@ucdavis.edu) and Dr. Magdalena Huyskens (mhuyskens@ucdavis.edu), who will train the visiting students in sample preparation, clean lab procedures, analyses, data reduction and interpretation.

Data Acquisition, Processing and Interpretation: During the visit, the student will be trained on data acquisition and processing of all collected samples. Most of the software is open source and will be provided to the student. Data reduction for LA-ICP-MS has to be completed prior to the departure of the student from the laboratory, since it is not open source, a third party software.

Expected Lab Availability: Typically, the student can schedule time with at least a month lead time.

Laboratory location:

Yin Lab (Isotope Geochemistry, Geochronology and Cosmochemistry Laboratory)
Department of Earth and Planetary Sciences
University of California, Davis
Earth and Physical Sciences Building
462 Crocker Lane
Davis, CA 95616

Lab/facility website: yinlab.faculty.ucdavis.edu

Departmental website: geology.ucdavis.edu