WiscSIMS

A primary goal of the WiscSIMS Lab (University of Wisconsin- Madison) is to provide experienced and inexperienced SIMS users with the best possible analytical precision and accuracy for *in situ* analysis of stable isotope ratios at the scale of 1 to 10 micrometers. The unique ion microprobe capabilities permit analyses in thin section or polished mount to be correlated with textures and information from optics, imaging, or other forms of instrumental analysis, including radiogenic isotope tracers and geochronology. In combination, such data can provide fundamental new levels of understanding for samples of Geological interest. The advantages are especially great for samples that are zoned, precious, or very small, which can't be analyzed by other means.

WiscSIMS personnel provide advice and assistance on a range of related scientific and technical issues. Guest scientists should be experts in the science behind their study and the details of their samples. Most samples require imaging by SEM (BSE, CL, SE). Guest scientists should image their own samples (at WiscSIMS or elsewhere) and come to WiscSIMS to participate in analysis. They will work full time during analysis with a research scientist from WiscSIMS. No prior experience with SIMS analysis is required.

The WiscSIMS lab houses a CAMECA IMS-1280. The IMS-1280 is a large radius multi-collector ion microprobe incorporating many improvements over earlier instruments, several of which are designed to enhance precision and accuracy of isotope ratio analysis.

Use of associated instrumentation at nominal cost can be arranged in support of projects at WiscSIMS including: an Hitachi S3400N Variable Pressure Scanning Electron Microscope with capability for imaging uncoated samples, Electron Back Scatter Diffraction (EBSD), color-filtered CL, EDS, and BSE detectors; a CAMECA SXFiveFE electron microprobe with 5 crystal spectrometers, Field Emission Gun, EDS, CL, and BSE; a conventional and laser fluorination stable isotope lab; and a white light optical profilometer.

ANALYTICAL CAPABILITIES FOR WiscSIMS FACILITY USERS:

Currently, the following stable isotope analyses are well-established and routinely available to external users. The beam sizes are typically 10µm and analyses take 3-10min/spot. Mineral analysis is limited by availability of standards. Potential users should inquire about creation of other standards.

Oxygen isotopes ($\delta^{18}O$) with ~10 µm spots:

Zircon, quartz, olivine*, pyroxene*, garnets*, titanite*, calcite*, aragonite, dolomite-ankerite*, magnesite-siderite*, plagioclase*, K-feldspar, spinel*, chromite*, epidote*, opal, coesite, silicate glass*: precision typically ~0.3‰ (2SD)

Carbon isotopes ($\delta^{13}C$) with ~8 µm spots:

Diamond, graphite: precision typically ~0.4‰ (2SD)

Calcite, aragonite, dolomite, ankerite, magnesite-siderite*,: precision typically ~0.7‰ (2SD)

Sulfur isotopes ($\delta^{34}S$) with ~10 μm spots:
Pyrite, anhydrite, pyrrhotite, chalcopyrite: precision typically ~0.4‰ (2SD)

Si isotope ($\delta^{30}Si$) with ~10 μm spots:
Quartz: precision typically ~0.2‰ (2SD)

*For phases with variable chemistry, we request that users obtain EPMA data of individual spots prior to SIMS analyses for correction of matrix effects.

An analysis with smaller beam sizes down to 2 μm is available for some systems, but analysis is slower (15-30 min/spot) and with degraded precision (~1‰). Other applications with more difficult samples, requiring new standards, or with Li isotopes ($\delta^{7}Li$), Mg three isotopes ($\delta^{25}Mg$, $\delta^{26}Mg$, and excess $\delta^{26}Mg$), oxygen three isotopes ($\delta^{18}O$, $\delta^{17}O$, and $\Delta^{17}O$), and sulfur three and four isotopes ($\delta^{33}S$, $\delta^{34}S$, $\delta^{36}S$, $\Delta^{33}S$, and $\Delta^{36}S$) may also be available. Please contact us for more detailed information.

WiscSIMS receives a subsidy from NSF/EAR Instrumentation and Facilities Program, and external NSF-funded investigators receive priority in allocation of instrument time and are eligible to perform analyses at a subsidized rate. As of July 1, 2016, the NSF-subsidized rate is $1,800/day (12 hours), and is applied to US federally-funded research.

WiscSIMS: http://www.geology.wisc.edu/facilities/wiscsims/