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HIP - Heidelberg Ion Probe
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User policy for the Heidelberg Ion Probe (HIP)

1. The user policies for the HIP CAMECA IMS 1280-HR and peripheral equipment ("the facility") apply to all users.

2. Laboratory safety regulations are posted in the lab and on the facilities' website, and must be obeyed at all times.

3. Contact persons for technical questions and laboratory safety are Stefan Johänntgen, Thomas Ludwig, and Sonja Storm, PhD. Scheduling requests and scientific questions regarding the feasibility of analyses should be directed to Thomas Ludwig. Prof. Dr. Axel K. Schmitt and Prof. Dr. Mario Trieloff are available for scientific consultation.

4. The HIP CAMECA IMS 1280-HR is the centerpiece of a DFG-funded multi-user facility dedicated to the isotopic microanalysis of materials relevant to cosmo- and geochemistry. Its goals are to:

- enable the scientific community to determine the isotopic compositions of a wide range of natural and synthetic materials at the highest possible accuracy and precision;
- develop new applications in secondary ionization mass spectrometry (SIMS) that will benefit cutting-edge research in cosmo- and geochemistry;
- provide opportunities for researchers and students to use and learn about the potential of SIMS in a wide range of scientific applications in the Earth Sciences and affiliated disciplines.

The IMS 1280-HR is a second-generation large magnet-radius SIMS instrument capable of analyzing positive or negative secondary ions at high sensitivity and spatial resolution. Ion sources are a duoplasmatron (producing positive and negative oxygen ions) and a Cs_2CO_3 source (thermally generating positive Cs ions). A normal-incidence electron gun is available for charge compensation during negative ion analysis of insulators. Samples and mounting materials cannot exceed 25.4 mm in diameter and 5 mm in height, and they must be ultrahigh vacuum compatible, have flat surfaces, and for insulators be coated with a conductive layer (mostly Au or C). New high precision sample holders permit reliable analysis within 8 mm from the center of the mount; targeting outside this "bulls-eye" area is not recommended. An eight sample airlock system allows for rapid change of samples. The sample surface is imaged by a reflected light microscope. Automated analysis is possible at stage position reproducibility of 2 µm. The large magnet radius (585 mm) enables high transmission with insignificant loss up to a mass resolution m/Δm of 6,000, and high mass resolution (m/Δm up to 30,000) over a total mass range of ca. 300 amu (i.e., from H to UO_2). Multicollection using five moveable trolleys equipped with interchangeable electron multipliers (EM) and Faraday cups (FC) is possible from Li to U. Analysis spots are typically ~20 µm (O^- beam in Köhler mode for

routine geochronology) and ~10 µm (stable isotope analysis using a focused Cs^+ beam); smaller ion beams are tunable for special applications such as scanning ion imaging. The IMS 1280-HR also acts as an ion microscope which can image secondary ions emission from the sample surface by means of a channel plate, and a resistive anode encoder. Like its smaller (e.g., IMS 3F analogs, the IMS 1280-HR is also capable of depth profiling at 10's of nm resolution. Routine geochronologic applications have a sensitivity (useful yield = ions detected over atoms removed) of 1% for Pb+ and reproducibility for Pb/U of 1-2% (1 standard deviation) that is equivalent to SHRIMP instrumentation. Uncertainties for routine stable isotope (e.g, C, O, S) analysis using FC detectors are ~0.2‰ (~0.6 ‰ with EMs). The lab offers access to peripheral instrumentation required for pre- and post-analysis sample characterization (e.g., optical microscopy, stylus- and contact-free surface profilometry), and provides guidance and support in data reduction (e.g., software) and interpretation. Inexperienced users are advised to use sample preparation facilities available at HIP because mounting and surface preparation are critically important for analysis success.

5. An initial application form on the HIP lab website must be submitted and evaluated by lab staff prior to requesting HIP services in any proposals. This application should briefly summarize the project, and specify the nature and number of samples (including standard availability), project timing, and any needs for additional services (e.g., sample preparation). HIP personnel will provide a written response to the application form. They are also available to assist with proposal preparation as it pertains to services provided by the HIP facility. A new application must be submitted for each service.

6. Instrument time will be allocated in consultation with a five-person steering committee (two voting members from the HIP facility, three from outside). Prioritization will be granted based on the sequence of application, instrumental condition (e.g., positive secondary ion analyses will be conducted en bloc to minimize re-tuning time), and resource availability (e.g., staff hours). Should timing conflicts arise, they will be resolved by the steering committee considering project urgency (e.g., graduate student involvement) and scientific merit in addition to the above criteria.

7. In accordance with the DFG, operating costs are set to 1100.00 EUR per day for collaborative research. A normal working day is considered to consist of 8 hours. Users of the IMS 1280-HR are permitted to work extended hours once they have received training by lab staff. Two or more analysts are required to keep the instrument operating efficiently over extended periods of time. We emphasize that it is imperative for investigators to accompany their students to provide the guidance necessary to ensure efficient use of the analysis time. Cost calculation is in accordance to: *„DFG 55.04 Hinweise zu Gerätenutzungskosten und zu Gerätezentren*" taking into account project-related instrumental expenses and laboratory consumables, personnel costs, and investment for instrumental upgrades.

8. Lab users are required to appropriately prepare, label, and safeguard their own samples. The only samples permitted in the lab are those which will be examined in a given analysis session. At the end of each analysis session, all samples and supporting documentation must be promptly removed from the laboratory. If a user is not qualified or otherwise unable to remove samples from the IMS 1280-HR after analyses have been completed, a prior arrangement must be made with laboratory personnel to recover samples prior to departure. HIP staff shall not be liable for loss or destruction of samples when handled within the limits of standard operating procedures.

9. Data and backups will be stored by the lab for the foreseeable future. The user is solely responsible for proper long-term data storage.

10. We expect all users to adhere to the rules of good scientific practice, as specified in DFG recommendations (*http://www.dfg.de/en/research_funding/principles_dfg_funding/good_scientific_practice/*). Publications must credit DFG by including the following sentence in the acknowledgments section of journal articles:

The HIP facility at Heidelberg University is operated under the auspices of the DFG Scientific Instrumentation and Information Technology programme.

Users are required to report all published work and completed student theses that have used HIP data to the facility via the “Publications and Theses” entry form on the Website.

11. While all the personnel of the HIP facility take an active interest in assisting visitors, their specific roles in projects of facility users can be flexibly arranged. Specifically, this means that there is no requirement (explicit or implicit) that HIP scientists become actively involved in scientific interpretations, and certainly no expectation for co-authorship on routine data acquisition work. If HIP users seek the expertise of facility researchers in the interpretative aspects of their work, their projects might benefit from a collaborative effort, and thus facility researchers should be acknowledged according to good scientific practice. We believe that it is not only useful, but necessary, that the facility be staffed by expert scientists who are not merely technologists but are also actively engaged in research.

Heidelberg, December 04 2015