

Specific lab rules/procedures for surface analysis facility

Jing Li, facility manager

The Surface Analysis facility at Materials Analysis Center at Arrhenius Laboratory MACAL offers user access to 4 equipment: Micromeritics Gemini VII (Gemini), Micromeritics ASAP 2020 (ASAP), Malvern Instruments Zetasizer Nano Series (Zetasizer), and QSense Analyzer-QCMD (QCMD) (all in lab room C419). The facility is part of MACAL, so usage will primarily follow MACAL policies,

https://www.su.se/polopoly_fs/1.688295.1699262209!/menu/standard/file/policyMACAL_2023-03-28%20%283%29.pdf

1. General policy for training

All instruments in the MACAL Surface Analysis facility are registered in a booking system (LIMS). New users who wish to operate equipment unsupervised must contact Dr. Jing Li, the manager for surface analysis core, and undergo training until they are approved as independent users. Only approved independent users are allowed to book and operate the instrumentation. To ensure MACAL functions as an open user facility, it is crucial that all users strictly adhere to the rules and procedures set by the facility managers. Any deviation from training procedures, unauthorized manipulation of equipment, or operation without prior booking is considered a violation and may result in penalties, including additional fees or suspension of access. Regular training sessions will be scheduled within a fixed week each month, lasting up to five consecutive workdays. Training sessions will follow a first-come, first-served queue system managed by Jing Li. Up to two instrument training sessions can be conducted within a 4-hour slot, and multiple sessions may be required to gain independent user approval. Training Fees and Conditions: Training for Kemikum students (bachelor, master's in sustainable chemistry, and PhD) is free of charge. Advanced-level training covering instrumental operation, experimental design, and method development is considered assisted usage and subject to a fee. See facility homepage: <https://www.su.se/department-of-materials-and-environmental-chemistry/research/infrastructure/surface-analysis-1.606267>

Bachelor and master students, exchange students, and PhD students conducting short-term projects (≤ 6 months) are not eligible for training on adsorption instruments (Gemini and ASAP2020). The Gemini, ASAP2020, and Zetasizer offer flexibility in accommodating both standard and advanced experimental setups. To request instrument access: Standard and non-standard setup requests for Gemini and ASAP2020 must be submitted to Dr. Jing Li at least four weeks in advance. If research is paid for or subsidized by a company, external non-academic user fees apply. Additionally, operator fees for training and instrument assistance will be charged accordingly.

Registration and Assistance: all training applicants must complete a registration form provided by Dr. Jing Li. The applicant will be contacted to discuss training arrangements. Instrument setup beyond one hour by the facility manager will be counted as assisted usage. Standard training only covers instrument operation following established protocols. Users are responsible for understanding the theoretical background and designing their own experimental programs. Jing Li may offer suggestions for optimizing user experiments only in cases where initial test measurements were unsuccessful. Extensive assistance beyond this will incur an additional fee. By adhering to these policies, MACAL ensures a structured, efficient, and safe environment for all users.

2. Specific policy for training of Micromeritics ASAP 2020 (ASAP)

Surface area analysis using gas adsorption methods is a complex process, and the Micromeritics ASAP 2020 (ASAP) is an extremely sensitive instrument. To ensure its proper functioning and longevity, strict guidelines for

usage and training are essential. Additionally, due to the significant running costs, users are required to share the expenses necessary for its maintenance.

ASAP Access

New users who want to use ASAP2020 should contact Dr. Jing Li, the facility manager. She will then organize how the access should be achieved, and give priority between the projects. There are two levels of access to the instruments;

- 1) Basic studies for surface area and analysis
- 2) Advanced studies for surface area and analysis

Basic ASAP training for basic gas adsorption studies

Basic training is required for users conducting routine surface area characterization. It includes introduction to conventional surface area calculations using liquid nitrogen or other gases. Multiple hands-on training sessions to ensure competency. Independent operation permitted only after completing the required training sessions.

Advanced ASAP training for advanced gas adsorption studies

Advanced training is intended for research groups engaged in long-term projects (minimum six months) requiring method development for gas adsorption studies. Key requirements include: A research group conducting advanced studies should have at least one trained member with ASAP access. Prior self-study of relevant literature, course materials, and instructional videos is required. A PhD student (or, in special cases, a researcher) in the early stages of their research project can receive training from Dr. Jing Li. A research group with strong expertise in gas adsorption methods or collaborations with qualified researchers at SU may conduct their own training. However, the MACAL laboratory manager must be informed, particularly when external researchers are involved.

Individuals seeking training (basic or advanced) must complete a registration form provided by Dr. Jing Li. Upon submission, the applicant will be contacted for further arrangements. The research leader of the applicant will be notified of the training plan. Compliance and Responsibilities: Users must strictly follow operational protocols to ensure instrument longevity. Any external training arrangements must be approved by the facility manager. Users are responsible for contributing to the operational costs of the ASAP.

Training of New Users for Gemini and ASAP2020

Learning to operate the Gemini and ASAP2020 requires significant time and commitment, particularly for advanced surface analysis studies using gas adsorption techniques. The additional instrumentation and accessories—such as sample degassing units, sample preparation procedures, and liquid nitrogen refilling—expand the range of possible studies, necessitating specialized training for each technique.

Training Duration: Basic ASAP2020 training requires approximately 5 full days to learn fundamental operations. **Advanced ASAP2020 training:** Involves method development for CO₂ adsorption and other advanced techniques, depending on the type of adsorptive gas and analytical model. This typically takes up to 10 full working days. **Additional Techniques:** Learning supplementary skills such as data analysis requires additional training periods beyond the basic and advanced sessions. The safety of operating the instrument is the sole responsibility of the user. As the ASAP2020's two measuring units share the same computer, users must take extra precautions to prevent operational conflicts.

3. Accessories for ASAP2020 and Gemini

All users must provide their own sample tubes and tube stoppers. Users must bring their own sample tubes for training sessions. MACAL may supply sample tubes only in cases where users lack them for their initial training session. MACAL can provide accessories only when available, primarily for infrequent users (e.g., those using the instrument once a year). Availability of MACAL-provided accessories is not guaranteed.

4. Disclosure and safety policy

- Users must inform the facility manager (Dr. Jing Li) about the nature of their samples before using MACAL surface analysis instruments.
- A risk assessment must be conducted in advance by any user intending to test hazardous, harmful, or pathogenic (bio)materials in instruments or lab spaces belonging to the Surface Analysis Facility.
- The risk assessment must be reviewed and approved by both the lab manager (Dr. Jing Li) and a safety officer at Kemikum before any experiments can proceed.

5. Acknowledgements and Publication

If substantial assistance beyond basic training is provided by the facility manager, such as support with data collection, advanced data acquisition, or data interpretation—resulting in findings included in a scientific publication, this may justify co-authorship for the facility manager. This follows the Vancouver recommendations for co-authorship (<https://innsida.ntnu.no/wiki/-/wiki/English/Co-authorship>). Additionally, it is important to recognize that gas adsorption-based surface analysis is a broad scientific field, and not all techniques are fully covered by researchers within the Department of Chemistry. For certain advanced techniques, researchers may need to seek expertise from outside the Department of Chemistry SU.