

Policy document for Electron Microscopy Center

Background

The Department of Materials and Environmental Chemistry (MMK) has a unique set of advanced transmission and scanning electron microscopes including sample preparation instruments. It is important that these instruments are used in an effective way and that they are easy to be accessed for researchers both from groups inside Stockholm University (internal users) as well as from other universities or academic institutes (external academic users) and companies (external users). The microscopes are very sensitive instruments and therefore a strict system/regulation how to use them and how to introduce and train new users is needed to keep them in perfect status. Furthermore, the running costs are significant and the users have to share the costs necessary for maintain them.

To secure and promote the use of instruments of this kind the Faculty of Science at Stockholm University has decided to give financial support to a “Core facility in Nano-technology” including the Nano-Fab Lab at Department of Physics and the Electron Microscopy Center (EMC) at MMK. This document is written to inform how to get access to the electron microscopes at MMK.

Access

New users who want to use the microscopes should contact one of the following persons in the Electron Microscopy (EM)-committee: Prof. Gunnar Svensson, Prof. Xiaodong Zou, Docent German Salazar-Alvarez, Dr. Kjell Jansson, Dr. Cheuk-Wai Tai and Dr. Wei Wan. They will then organise how the access should be achieved and give priority between the projects. There are three levels of access to the instruments;

- 1) Short term studies with operator
- 2) Long term studies with operator
- 3) Long term studies without operator.

In this context the operators are normally Kjell Jansson for scanning electron microscopy (SEM) studies and Cheuk-Wai Tai for the transmission electron microscopy (TEM), if not others are stated. Members in the EM-committee should sanction the use of other operators.

The short-term studies are intended for researchers who need help with minor electron microscopy studies and do not have the competence within their group to run the microscopes. It also includes so called test runs to check if electron microscopy is a feasible technique. Short-term studies encompass up to 2 sessions per year.

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Long-term studies are extensive studies with repeated sessions at the microscopes. Since the time available for Kjell Jansson and Cheuk-Wai Tai is limited it is necessary to discuss these studies with Gunnar Svensson. It can be necessary to make priority lists. Internal users from SU have a higher priority. After such a discussion a contract will be set up stating how much time is available.

Long-term studies without operator are when the research group has a person with competence for the EM or have collaboration with a researcher inside SU with such competence. However, it is very important that the responsible persons for the EM-laboratory are informed about this arrangement, especially when external researchers are involved.

Finally, it should be noted that electron microscopy is such a broad scientific field that the researchers at MMK do not cover every technique in detail. This means that for some more advanced techniques the researcher has to get the competence from outside MMK.

Training of new users

At the EM laboratory there are at present three scanning electron microscopes and four transmission electron microscopes. Learning the operation of an electron microscope is very time consuming, especially transmission electron microscope. The course "Introduction to Analytical Electron Microscopy (KZ8009)" or equivalent is a prerequisite. It is important that the EM instruments are run after the same protocol. All new users will therefore be given the basic training in how to run the microscopes. The extra instrumentation/accessories on SEM and TEM make the number of possible studies numerous and the user will need special training for each technique. The user can be experienced when it concerns microanalysis of particles in a TEM but not necessary being qualified to run EELS/EFTEM or STEM. It should also be noted that to learn basic SEM approximately 5 full days are required, while the basic TEM (imaging and selected-area diffraction) with EDS typically takes 10 full days. Here one usually starts with the basic instruments, such as JEM 2000FXII. To learn additional techniques like basic scanning transmission electron microscopy or basic electron energy loss spectroscopy additional training periods are needed.

SEM training

A person who wants to be trained in SEM should fill in the special form provided by Kjell Jansson. He continually trains new users for the SEM, acts as adviser for trained users, helps other research groups and provides service to the microscopes. As his time is limited, therefore each research group, which has a need for repetitive SEM studies, should have at least one member with access to the microscopes. This includes research groups outside MMK at SU. However, this cannot always be fulfilled immediately due to time limitations.

TEM training

A person who wants to be trained in TEM should fill in the special form provided by Cheuk-Wai Tai. He will then take contact with the applicant. The training of new TEM users is very time consuming. It is therefore necessary to make priority lists. However, it is the intention that each research group, which has a need for repetitive TEM studies, should have at least one member with access to the microscopes. The training of new users will mainly be taking care of by Cheuk-Wai Tai. It is also possible to get trained by one of the senior users after discussing with the EM-committee.

Samples

SEM and TEM instruments are very sensitive and some samples are not suitable to put in the microscopes. Special care should be taken with samples, which could be suspected to be magnetic or contain organic or other volatile substances. It is therefore obligatory to consult Kjell Jansson for SEM or Cheuk-Wai Tai for TEM before first putting a new type of sample in the microscope.

Costs

There are three levels of fees: *internal*, *external academic* and *external users*.[†] Long term users from outside Stockholm University are recommended to contact with Gunnar Svensson to write a contract.

Students and staff members employed or associated with SU pay the *internal user fee*. No additional fee is needed for training. However, if the user does contract research paid or subsidised by a company, the *external non-academic user fee* is applied and the *operator fee for the external user* is additionally charged for the training.

MSc/PhD students and researchers from other university/academic institute pay the *external academic user fee*, which is the *internal user fee* plus a *yearly bench fee* (20 000 SEK). The *operator fee for internal user* is applied when the training is needed. However, if the user does contract research paid or subsidised by a company, the *external user fee* is applied and the *operator fee for the external user* is additionally charged for the training.

All non-academic users pay the *external user fee* for running the microscope or equipment. The *operator fee for the external user* is additionally charged for the training.

[†] Value added tax (VAT) is not included in the fees listed.

Electron microscopes

There are, in general, two core sessions (4 hours each) in a working day: morning session (09:00-13:00) and afternoon session (13:00-17:00).

| Instrument | Internal user (cost for operator) SEK/session | External user (cost for operator) SEK/session |
|------------------------|----------------------------------------------------------|----------------------------------------------------------|
| SEM – JSM 7000F | 800 (1200) | 3900 (4800) |
| SEM – JSM 7401F | 800 (1200) | 3900 (4800) |
| SEM – TM-3000 | 500* (1200) | 2800 (4800) |
| TEM – JEM 2000FXII | 400 (1200) | 4000 (5000) |
| TEM – JEM 3010 | 500 (1200) | 4000 (5000) |
| TEM – JEM 2100 LAB6 | 1200 (1200) | 4000 (5000) |
| TEM – JEM 2100F | 1200 (1200) | 5200 (5000) |

* 150 SEK/hour

Fees for sample preparations

| Instrument | Internal user (cost for operator, 300 SEK/h) | External user (cost for operator, 1200 SEK/h) |
|---------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------|
| Ion-milling | 300 SEK/h | 1700 SEK/h |
| Ion Slicer | 300 SEK/h | 1700 SEK/h |
| Cross Section Polisher | 30 SEK/h | 150 SEK/h |
| Carbon sputter | Costs for consumables | Costs for consumables |
| Gold sputter | Free of charge | Free of charge |
| Polishing paper, sample cutter, TEM grids, etc | Cost for consumables | Costs for consumables |



How to pay

Internal users at MMK

Research groups inside MMK pay their fees every half a year to the department.

Internal users from departments other than MMK inside SU

- Short-term studies will be debited when the study or test is completed. The first 2 sessions for a research group will be paid by the “Core facility in Nano-technology”
- Long-term studies with and without operator will be debited two times per year.

External academic and external users outside Stockholm University (other universities, institutes, industry...)

- Short-term studies will be debited when the study is completed.
- External users who want long-term studies are recommended to write a contract with MMK.

Contact person

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