

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 company users). The microscopes are very sensitive instruments and therefore a strict system/regulation how to use them and how to introduce and train new user 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 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, Prof. Aji Mathew, Dr. Anumol Ashok, Dr. Kjell Jansson and Dr. Cheuk-Wai Tai. They will then organise how the access should be achieved and give priority between the projects. EMC-staff encourages PI:s to contact EMC to discuss possibilities and future need for EM in their research. 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) and Anumol Ashok and Cheuk-Wai Tai for the transmission electron microscopy (TEM), if not others are stated. In addition Tom Willhammar and Thomas Thersleff are working 15% each of fulltime for EMC. 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 perform the study. It

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also includes so called test runs to check if electron microscopy is a feasible technique. Short-term studies encompass up to 5 sessions per year.

Long-term studies are extensive studies with repeated sessions at the microscopes. Since the time available for Kjell Jansson, Anumol Ashok and Cheuk-Wai Tai is limited it is necessary to discuss these studies with Gunnar Svensson. 40% of their time is allocated for short term and long-term EM-studies. In addition, Tom Willhammar and Thomas Thersleff are available (15% of fulltime each during 2021) for short and long term studies. The chair of EMC, application specialist and group leader will meet to make a time plan. The EMC-committee will make priority lists between such projects. Internal users from SU have the highest priority.

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.

Acknowledgements and Publication – Your use of EMC facilities is heavily subsidised by Department of Materials and Environmental Chemistry and Faculty of Science, Stockholm University and by grants from external funding agencies. EMC has the obligation to report on the publications produced by our users of the Center. Therefore, the users should provide the publications and reports in which the results obtained using EMC facilities, including instruments, computer software and staff advice. In the publication or report, EMC and any assistance provided by EMC staffs should be acknowledged. EMC staffs, who acquired and/or interpreted the results, should be invited to be co-authors of the publication. For co-authorships the policy follows the Vancouver recommendations for co-authorship (<https://innsida.ntnu.no/wiki/-/wiki/English/Co-authorship>). If EMC staffs' contribution is not enough to justify co-authorship, the acknowledgement in the publication should be: "The authors acknowledge the use of the EM facilities and the assistance of (NAME of STAFF) at Electron Microscopy Center at Stockholm University". If our Themis Z microscope was used, the acknowledgement should be "This work was performed, in part, at the Electron Microscopy Centre, supported by the Department of Materials and Environmental Chemistry and Faculty of Science at Stockholm University, Sweden". If our JEOL microscope was used, "The Knut and Alice Wallenberg Foundation is gratefully acknowledged for an equipment grant for the electron microscopy facilities at Stockholm University" should be included in the publication or report. The publication reference should be sent to Dr. Anumol Ashok. EMC would appreciate if a soft copy of the publication can be provided. It will be displayed in the Center.

Training of new users

At the EM laboratory there are at present three scanning electron microscopes and three transmission electron microscopes. Learning the operation of an electron microscope demands a great deal of time and commitment, especially transmission electron microscope. The course

“Introduction to Analytical Electron Microscopy (KZ8009)” or equivalent (theoretical self-studies using a suitable book in transmission electron microscopy and instruction films on internet are an option) 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. 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 Anumol Ashok or Cheuk-Wai Tai. The applicant will then be contacted. The training of new TEM users demand a great deal of time. 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 Anumol Ashok and Cheuk-Wai Tai. It is also possible to get trained by one of the senior users after discussing with the EM-committee. The training will be more efficient if the adept prepares the sessions with intensive studies of relevant literature and instruction films on internet.

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 Anumol Ashok and 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 company users*.[†] Long term users from outside Stockholm University are recommended to contact Gunnar Svensson to write a contract.

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

Students and staff members employed or associated with SU pay the *internal user fee* for instrument time. Each research group (defined as group leader) at Stockholm university has right to operator help free of charge 20 hours / max 5 sessions per year for training or service. 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 universities/academic institutes pay the *external academic user fee*. The *operator fee for external academic user* is applied when the training is needed. However, if the user does contract research paid or subsidised by a company, the *external company user fee* is applied and the *operator fee for the external company user* is additionally charged for the training.

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

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). For external academic users there is a bench fee of 25 000 SEK/year.

Instrument	Internal user (cost for operator) SEK/session	External Academic (cost for operator) SEK/session	External Company (cost for operator) SEK/session
SEM – JSM 7000F	800 (1200)	2000 (3200)	4000 (4800)
SEM – JSM 7401F	800 (1200)	2000 (3200)	4000 (4800)
SEM – TM-3000*	500** (1200)	1600*** (3200)	2800 (4800)
TEM – JEM 2100 LaB6	1200 (1200)	2800 (3200)	4000 (4800)
TEM – JEM 2100F	1200 (1200)	2800 (3200)	5000 (4800)
TEM – Themis Z	3000 (1200)	6400 (3200)	10000 (4800)

*No bench fee for single users, **150 SEK/hour, ***400 SEK/hour

Fees for sample preparations

Instrument	Internal user (cost for operator)	External Academic (cost for operator)	External Company (cost for operator)
Ion-milling	300 SEK/h (300 SEK/h)	300 SEK/h (800 SEK/h)	1700 SEK/h (1200 SEK/h)
Ion Slicer	300 SEK/h (300 SEK/h)	300 SEK/h (800 SEK/h)	1700 SEK/h (1200 SEK/h)
Cross Section	30 SEK/h	80 SEK/h	150 SEK/h

Polisher	(300 SEK/h)	(300 SEK/h)	(1200 SEK/h)
Carbon sputter	Costs for consumables (300 SEK/h)	Costs for consumables (800 SEK/h)	Costs for consumables (1200 SEK/h)
Gold sputter	Free of charge (300 SEK/h)	Free of charge (800 SEK/h)	Free of charge (1200 SEK/h)
Polishing paper, sample cutter, TEM grids, etc	Cost for consumables	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 EMC”
- 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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