

How to use the EMC-M?

Dr. Ute Kolb am 21.07.2021

1. Clarification of the question

What exact questions do I have regarding my sample?
Can this question be solved with the help of electron microscopy?
Which device is suitable for this?
Which examinations have I already done?
How should the sample be handled?
Which preparation methods are to be used?
Which measurement methods are useful?
Which evaluations have to be carried out?

These questions should be clarified in advance and / or in a preparatory discussion with the scientific contact person.

2. Contact person:

Dr. Ute Kolb, Institut für Physikalische Chemie, Duesbergweg 10-14, D-55128 Mainz
Zimmer 01/434, Tel. +49 6131 3924851

3. Existing equipment (Department Chemie, Pharmazie und Geowissenschaften):

Transmission electron microscope:

300 kV FEI Tecnai F-30, EDX, STEM (HAADF), Cryo

120 kV Tecnai Spirit, EDX, STEM (HAADF), Cryo

Scanning electron microscope:

FEI Phenom - tabletop device

FEI Nova NanoSEM 630, EDX, lithography, cryo-chamber (physics location)

4. Zur Verfügung stehende Methoden (Fachbereich Chemie, Pharmazie und Geowissenschaften):

Preparation techniques:

Vitrification

Ultramicrotomy

Ultrasonic atomization

Imaging:

Transmission electron microscopy (TEM)

Scanning Transmission Electron Microscopy (STEM)

High resolution transmission electron microscopy (HRTEM)

Real space tomography

Scanning Electron Microscopy (SEM)

Element analysis:

Energy dispersive X-ray spectroscopy (EDX)

Diffraction:

Selected Area Electron Diffraction (SAED)
Nano diffraction (NED)
Automatic Diffraction Tomography (ADT) = reciprocal space tomography
Electron beam precession technology

Data processing:

3D reconstruction
tomography
Dynamic calculations

5. Costs

Fees are charged for using the devices. The internal cost rates apply to employees of the university and the MPI-P (price list, see appendix). Overhead and VAT are charged on usage fees for external users. The devices can only be used if there is a written confirmation of the assumption of costs. You can obtain the form from the contact person or on the EMZM homepage (<https://www.emzm.uni-mainz.de/> and <https://www.emcm.uni-mainz.de/>). The times used are evaluated via the booking system and billed quarterly.

6. Permission to use

The devices may only be used after consultation with the scientific contact person. They decide whether the electron microscopic knowledge you have brought with you is sufficient. It is possible to acquire this knowledge by attending the electron microscopic events offered (in the form of a lecture, seminar or internship, depending on the requirements). In any case, however, you must be instructed in how to operate the devices yourself. A briefing can be obtained from the contact persons on request. Depending on their level of knowledge, users are assigned to the groups beginners, advanced and experts.

7. Device booking

To make a booking, users are given access to a calendar for each device for which there is a usage permit. The electron microscope can be booked at any time, but not more than 4 weeks in advance. If the device is overbooked, the supervising scientist can postpone the times already booked in consultation with the users. In principle, all instructed users can work alone during their core working hours. The use of the devices outside of core working hours is only possible by the TEM experts or after appropriate instruction and only with special permission from the supervising scientist.

8. General use of conduct

The measuring room is opened by the contact persons. Keys for the EM420 can be assigned in justified individual cases. Basically, every device use must be entered in the user book with the start and end time. It is also asked to note any special observations. In the case of older TEMs without a user-specific adjustment option, the basic adjustment may only be carried out by the expert group. The use of special sample holders is reserved for the expert group (see Section 5). Carrying out special measurements (EDX, ADT) is only allowed for the advanced group after instruction by the responsible device supervisor. Commissioning is explicitly described on the respective devices. The devices must be left in their basic position (see instructions on the device itself).

9. Safety and maintenance

Safety is guaranteed by the radiation protection officer (Dr. Dieter Schollmeyer) and the safety officer for electron microscopy (Dr. Ute Kolb). The general rules for safety in laboratories apply. All users must take part in safety instruction at regular intervals (at least annually). The lists are posted on the respective transmission electron microscope. Use of the device is only permitted with a valid entry. Incorrect operation or unusual behavior of the devices must be reported to those responsible for the device immediately.

The instructions of the responsible persons must always be followed. In the event of repeated or serious violations, users can be temporarily or permanently denied access to the devices.

10. Handling of the measurement data

Data may only be saved in the designated areas (\ users). After the trade fair sequence, the relevant data is transferred to a support computer (Tecnai F30: Tecnai_f30_data, Spirit: Tecnaispieldata). In principle, all users ensure that their data is appropriately transferred from the support computers to other media. The backup and archiving of the measurement data in an archive takes place automatically via the data processing center of the University of Mainz when they are transferred to the support computer.

11. Service measurements

Service measurements can be carried out if familiarization with electron microscopy is not worthwhile due to the small scope of the question or if it is too time-consuming due to specialized measurement methods. All service measurements are the responsibility of the working group carrying out the work. This is responsible for performing the measurements, preparing reports and the costs incurred.