VAMAS

Quantitative Microstructural Analysis

Technical Work Area 37

Call for Participation

Project 10

A method to evaluate ion-beam alignment for FIB-SEM

Objectives

The purpose of this International Laboratory Comparison (ILC) is to develop a simple method that allows users to verify, before initiating FIB-SEM processing, whether the ion beam is in a condition suitable for processing. Since FIB milling is an irreversible destructive process, once processing begins, the sample cannot be restored to its original state. This verification method is particularly crucial in application fields requiring long processing times, such as 3D observation, measurement, and analysis.

Background

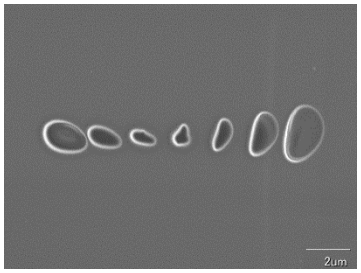
FIB-SEM supports a wide range of research and development across various fields such as material science, semiconductors, and biology, through its functions in TEM and SEM sample preparation, three-dimensional observation, measurement, and analysis However, those who have experience with electron microscope technologies like FIB-SEM, TEM, or SEM may have encountered the challenges associated with adjustment. Especially for users with limited experience, it can be difficult to determine whether the equipment is correctly adjusted. Providing such users with methods to evaluate the adjustment status is an essential component for the advancement of FIB-SEM technology.

Standardization Needs

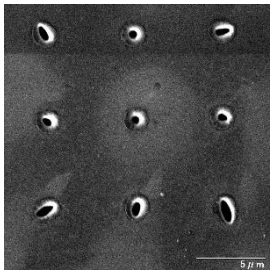
In fiscal year 2024, the Japanese Industrial Standards Committee (JISC) conducted a priority survey on standardization needs for FIB-SEM systems. The results revealed a strong demand for standardization of FIB-SEM equipment and its specifications, among which one of the topics raised was: "Users want a simple method to check the state of the ion-beam alignment before commencing processing."
This need serves not only as an indicator of operational proficiency for users with limited experience, but also as a means for users to verify the results of automatic alignment functions in FIB-SEM instruments. Moreover, in the ion-column of a FIB-SEM, components such as apertures and blankers are subject to wear from ion-beam milling effects. Given that the instrument condition changes daily, it is considered beneficial to employ this verification method as a way to monitor these evolving system states.

Work Programme

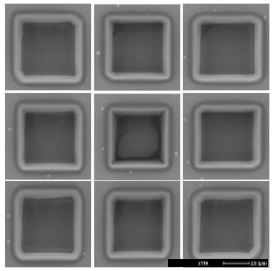
1. **Mar 2026:** Specimens will be delivered to participants along with the protocols.
2. **April/May 2026:** FIB processing on Si and observation will be done by the participants in accordance with the protocols provided.
3. **June 2026:** Data submission and analysis.
4. **Apr 2027:** Report based on this the results is prepared and delivered to participants.



(i) Focus array
Spot milling while changing focus. Users can recognize the status of adjustment for Focus, Objective Aperture and astigmatism by analyzing this focus array pattern.



ii) Aperture matrix spot
Spot milling while changing Aperture alignment. Users can recognize their adjustment status as a 2-deimesional distribution.



iii) Astigmatism matrix box
Box milling while changing Astigmatism. Users can recognize their adjustment status as a 2-deimesional distribution.

Statistical analysis of the results from participants will be conducted as consistent with ISO/TS 11308.

Deliverables and Dissemination

- Report based on this the results will be distributed to all attendees.
- A method to evaluate ion-beam alignment for FIB-SEM will be established by the ISO in the TC 202/SC4.

Funding

Participants fund their own involvement in the project.

Project Status

The project is due to start in February 2026 for a duration of up to 12 months.

References

ISO/FDIS 17297 FIB Vocabulary ISO/TC202/SC1 - in progress

ISO/CD 16887 Guidelines for TEM specimen preparation using FIB ISO/TC202/SC3 - in progress

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