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**Enabling Science and Technology through
European Electron Microscopy**

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Deliverable 6.2

Report on protocols and standards developed in ESTEEM2

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REPORT OF ACTIVITIES BY TU GRAZ

Input to Deliverable 6.2:

**Tip Preparation with a Focused Ion Beam Instrument
For Sample Quality Verification and Thickness Measurements**



Tip Preparation with a Focused Ion Beam Instrument For Sample Quality Verification and Thickness Measurements

The preparation of an ultra-thin, rod-like shaped sample tip with a focused ion beam instrument is a common method in atom probe tomography. With little variation, this method can also be used to prepare tips for TEM tomography and to measure sample thicknesses that are needed in analytical applications

This document describes a preparation procedure suitable to generate tip and lamella simultaneously for an Omniprobe (procedure 1) and “self-support” setup (procedure 2).

Preparation Procedure

Geometries in Procedure 1:

The FIB lamella is prepared conventionally to the point of the in-situ lift out procedure.

Lamella dimensions should be a minimum of 10 µm long and 1 µm thick, lamella depth can be adjusted to own needs (Fig.1a; 1b).

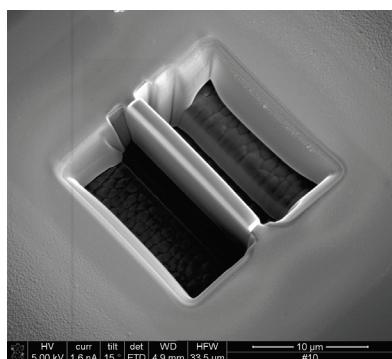


Fig.1a

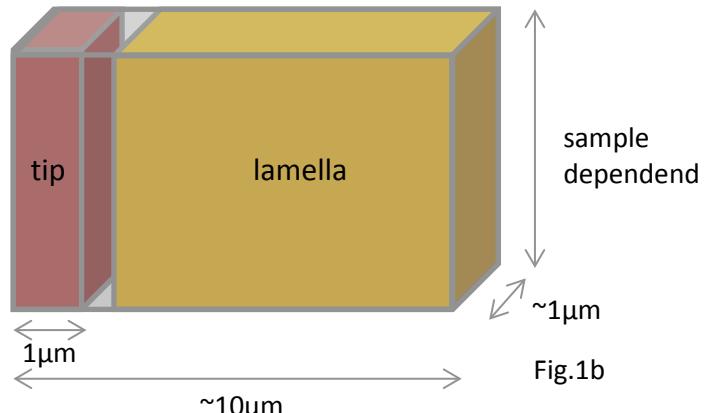


Fig.1b

The sample fixed on the Omniprobe transfer needle is brought in proximity to an Omniprobe grid. From the 10µm long lamella, a 1µm section is connected to the finger, which then is cut off (Fig.1a). The remaining lamella (~8 µm) is then mounted in flag position on the same finger or on the next finger of the Omniprobe grid (Fig.2a). The lamella is then prepared to electron transparency with sample depending parameters to generate a high quality TEM sample (Fig.2b).

The tip preparation should be performed with the same parameters as for the lamella! This ensures a consistent TEM investigation results (Fig.2c).

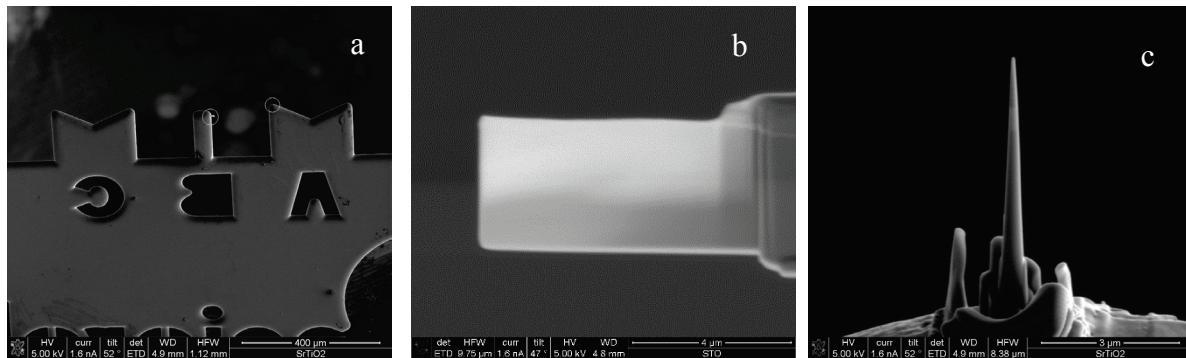


Fig.2a: grid with the tip fixed in top position on finger A and lamella fixed in flag position on finger B; Fig.2b: finished lamella; Fig.2c: finished tip

Geometries in Procedure 2:

Starting object is a semi-circle shaped disc with 3mm Ø ground as thin as possible (At the FELMI this step is often carried out with the Multiprep tool from Allied High Tech, but other ways are perfectly fine too)(Fig.3a).

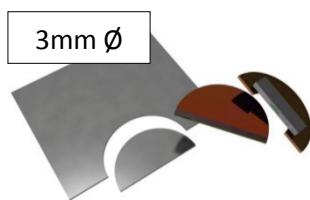


Fig.3a

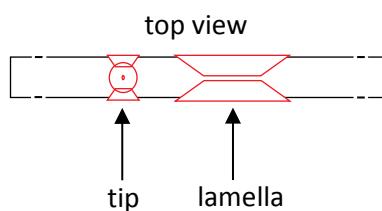


Fig.3b

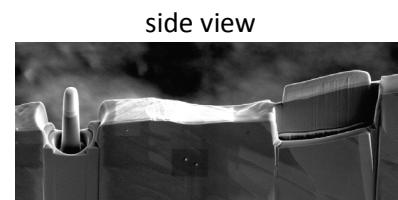


Fig.3c

FIB preparation: The disc is clamped into the FIB-TEM grid holder and both preparations (lamella and tip) are carried out under the same conditions (Fig.3b; 3c). Depending on the material, optimized procedures should be applied (cf. for instance to the semiconductor FIB preparation protocol)

