HR-(S)TEM Sample Preparation of Semiconducting Materials

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High-resolution scanning transmission electron microscopy (HR-STEM) samples are mostly prepared using Focused Ion Beam (FIB) milling. The aim of this work is to provide an alternative preparation routes for semiconducting materials using mechanical and ion thinning techniques. Samples of silicon, silicon germanium and gallium nitride are prepared. A general route is applied to understand the materials, and an alternative route (using the MultiPrep™ Polishing System from Allied High Tech) has been implemented based on the type and the characteristics of the sample material. Filtered and unfiltered bright field images are recorded from each sample, and t/λ graphs are extracted. These graphs provide an estimate of the sample thickness in relation to the mean-free path using the Log-Ratio-Method [1]. Based on the recorded t/λ maps, a conclusion and an optimal preparation route is recommended for each material prepared.

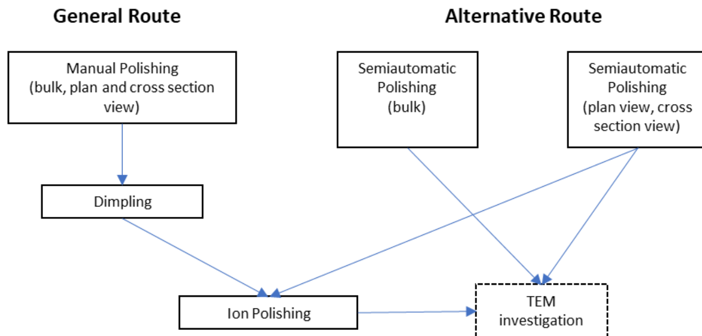

Figure 1: Overview of preparation routes implemented

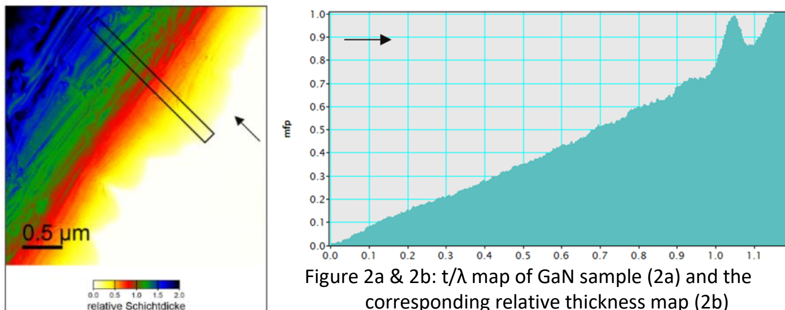

Figure 2a & 2b: t/λ map of GaN sample (2a) and the corresponding relative thickness map (2b)

[1] R. F. Egerton, “TEM Applications of EELS,” in *Electron EnergyLoss Spectroscopy in the Electron Microscope*, Springer, 2011, pp. 293-324.

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