HR-(S)TEM Sample Preparation of Semiconducting Materials

A. Alatrash [1, 2], E. Fisslthaler [2], M. Dienstleder [2], W. Grogger [1]

1. Institute of Electron Microscopy and Nanoanalysis, Graz University of Technology, Steyrergasse 17, 8010 Graz, Austria
2. Graz Centre for Electron Microscopy, Steyrergasse 17, 8010 Graz, Austria

Introduction

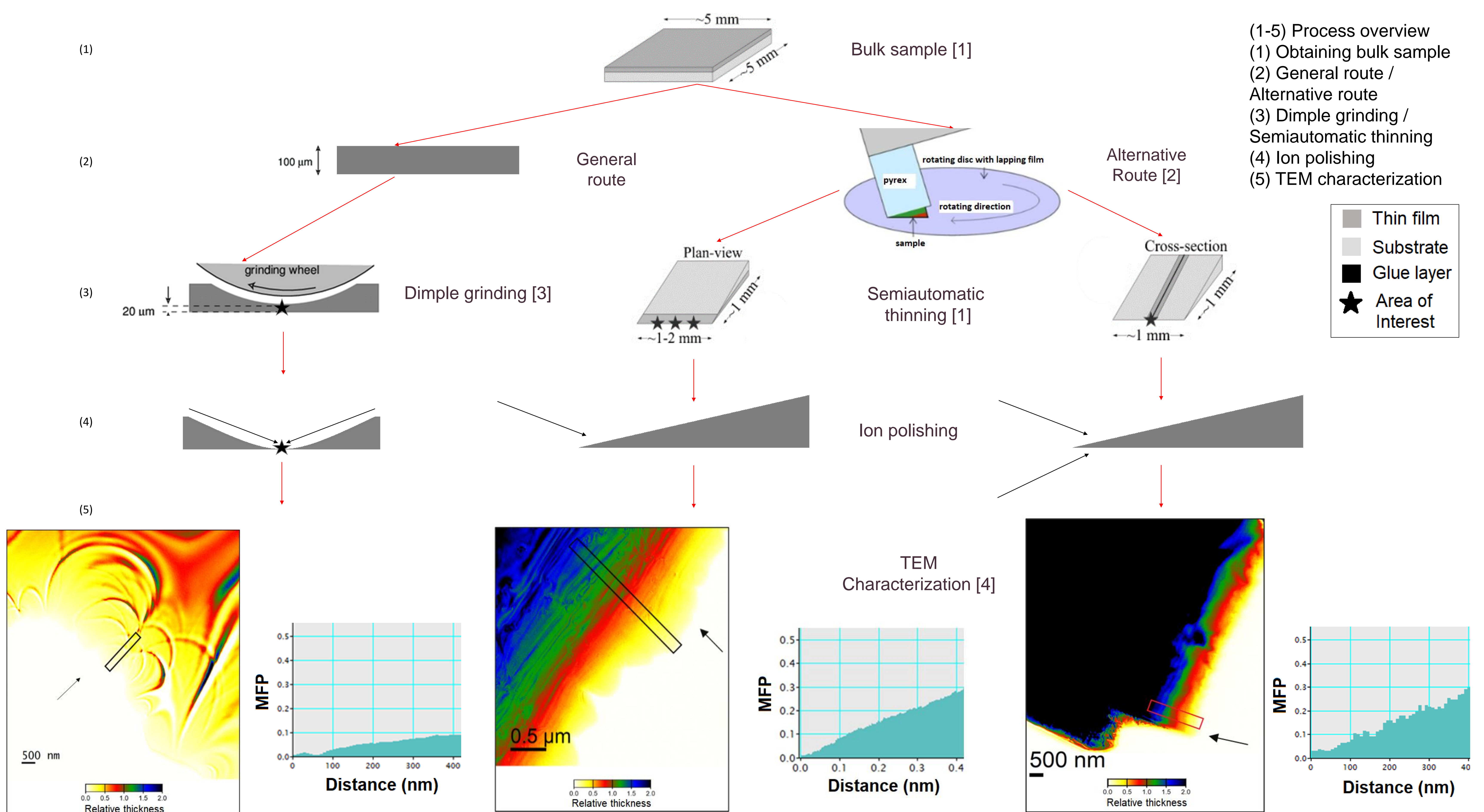
At FELMI-ZFE (Institute of Electron Microscopy and Nanoanalysis of Graz University of Technology, and Graz Centre for Electron Microscopy), we aim to provide the optimum sample preparation solutions for electron microscopy applications. HR-(S)TEM sample preparation from semiconducting materials is dominated by FIB. In this study, we seek to provide an alternative approach to sample preparation, mainly by combining mechanical and ion thinning techniques, to deliver optimal results for high resolution microscopy investigations. The material presented is gallium nitride deposited on aluminum oxide substrate.

Methods

Two routes were standardized for the purpose of this work. The first route is referred to as the “General route.” A disc was punched with Gatan’s Ultrasonic Cutter System, followed by manual polishing with Gatan’s Disc Grinder.

The second route is the “Alternative route.” This was done in two different settings, plan-view and cross-section-view. The sample was thinned and polished with the MultiPrep™ System from Allied High Tech using a succession of diamond lapping films. Further polishing – if required – was done using PIPS II.

Approach



Conclusion

Type/Criteria	Plan-view General route	Plan-view Alternative route	Cross-section-view Alternative route
Advantages	• Excellent quality • Good characterization area • Easy to reproduce	• Great quality • Wide characterization area	• Good quality • Shortest processing time 9 hrs~ • Samples are not fragile • Easy to reproduce
Disadvantages	• Long processing time ~30 hrs • Fragile	• Medium processing time 15 hrs~ • Fragile • Difficult process	• Small characterization area

References

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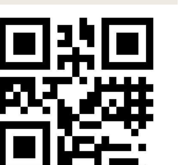
Contact

anas.alatrash@felmi-zfe.at
www.felmi-zfe.at



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