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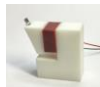
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 2. Institute of Electron Microscopy and Nanoanalysis, Graz University of Technology, Steyrergasse 17, 8010 Graz, Austria  
 3. Diatome Ltd, Helmstrasse 1, 2560 Nidau, Switzerland

## Introduction

The ultra sonic knife allows the cutting of ultrathin sections free of compression as well as absolutely flat sample blockfaces. Diatome Ltd is currently developing a cryo sonic diamond knife, whose prototype has already delivered outstanding results in TEM and AFM analyses. Felmi-ZFE designed suitable holders to measure the sample directly in the microscope without reclamping the sample after microtomy.



Ultra sonic diamondknife



Cryo sonic diamondknife



Felmi-ZFE designed optimal holders to measure samples in the microscopes without reclamping the sample after cryomicrotomy.

## Conclusion

New demands for the block-face smoothness have led to the development of a cryo sonic diamond knife. The elimination of cyclic compression and relaxation during slicing results in much more homogeneous block-face surfaces for AFM, as well as in thinner sections for TEM investigations (less than 20 nm can be achieved)

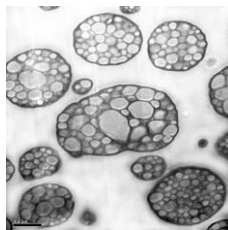
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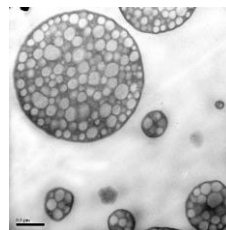
## Examples TEM

HIPS (*High-Impact-Polystyrene*)

Ultra Sonic

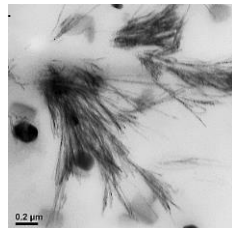


Ultra 35°

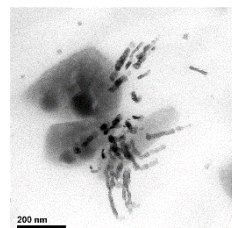


Ultra sonic

EDPM (*Ethylene propylene terpolymer*) with plasticizers and zinc  
 Cryo Sonic



0.2 μm



200 nm

*Preparation of ultrathin sections without cryo sonic is hardly feasible*

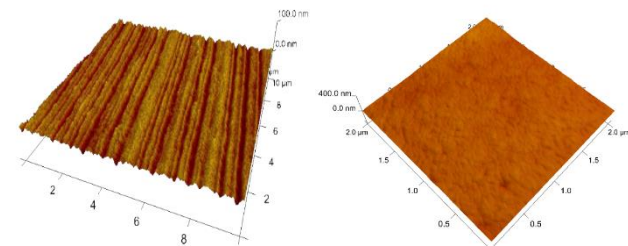
## Acknowledgements

Thanks to Markus Sittsam for the optimization and production of the cryo holder (**Holder is available from FELMI-ZFE**) and Armin Zankel for support.

This work was also enabled by the "Strategische ACR-Projekt Tribologische Optimierung von Polymeren (Triop)"

## Examples AFM

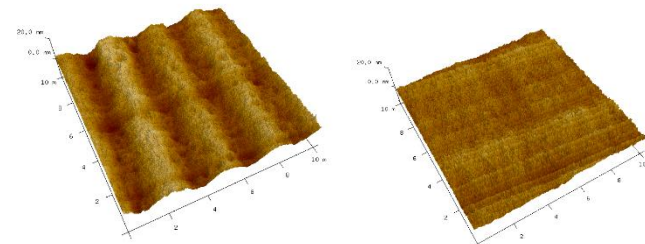
Cellulose Blockface



Ultra 35° Roughness 40nm 10 μm

Ultra sonic Roughness <10nm

Polyurethanpolymer



-140°C , histo cryo  
 Roughness <10nm

-140°C , cryo sonic  
 Roughness <3nm

## References/ Literature

- (1) Tipps and Tricks in Ultramicrotomy, C.Mayrhofer et.al., 2013. Poster session presented at MC 2013, Regensburg
- (2) Studer, and Gnägi, (2000), Minimal compression of ultrathin sections with use of an oscillating diamond knife. Journal of Microscopy, 197: 94-100.