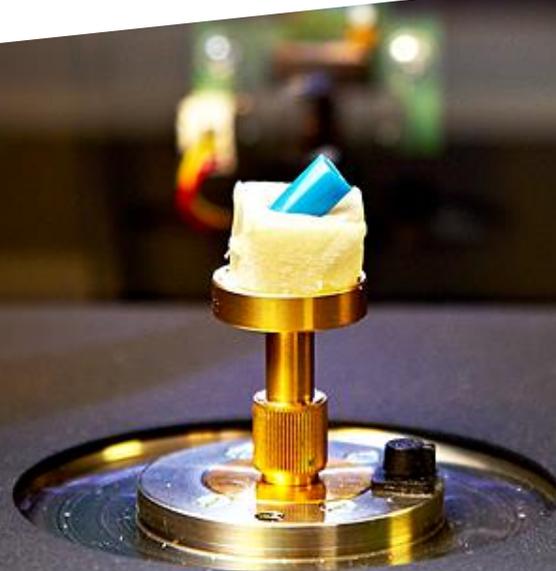




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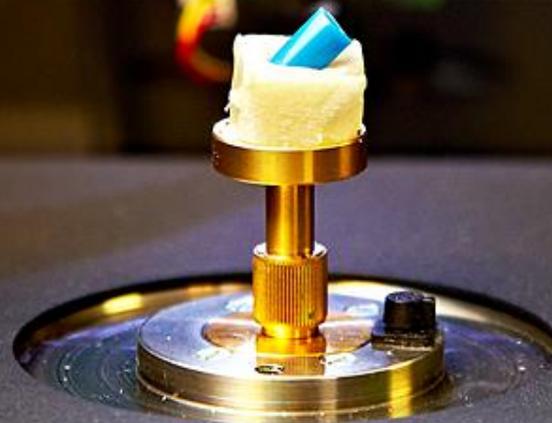
it's all about innovation





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μ CT Skanning – ERFA Maj 2013



μ CT Skanning hos Kvalitet og Måling

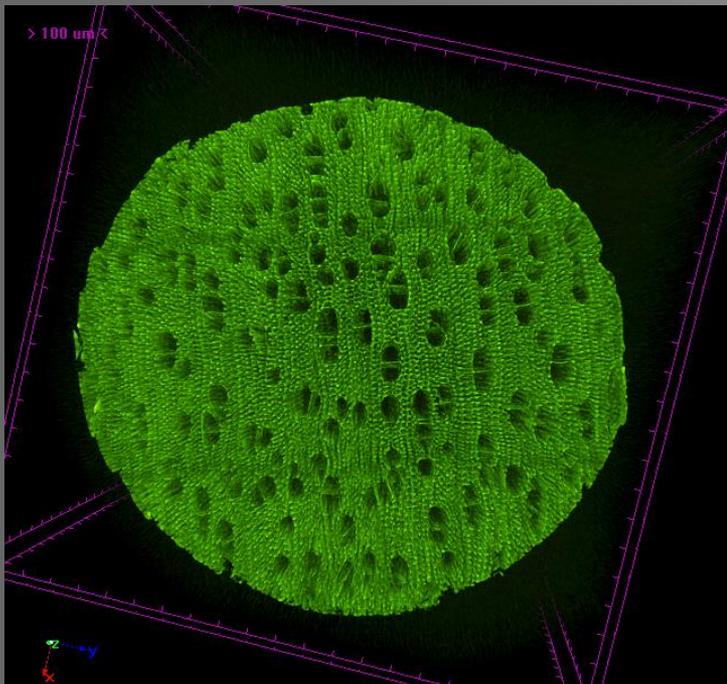
Bruker μ CT, Skyscan 1172

X-Ray tube: 20-100 kV

Detector: 4000 x 2300 pixels

Sample size: Ø27mm (single scan) / Ø50mm (offset scan)

'Detectability': < 0.7 μ m



Skyscan Software



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- Reconstruction Software: Nrecon
- CTvox: Volume rendering - visualization
- CTAn: Analysis of micro-CT data

Batch manager: listing batch jobs and the details

Start batch	Batch job	Status	Error	Description	Value
Submit again	4-10-2	pending		Scan profile	S:\QA\4-10-2\4-10-20000.tif
Remove all				Scanned with	
				Scan type	A single scan
				Input folder	
				Output folder	S:\QA\4-10-2\4-10-2_Rec
				Output format	8 bit BMP
				Dynamic range	0.01 - 0.063
				Pixel scale	Not calibrated

Histogram

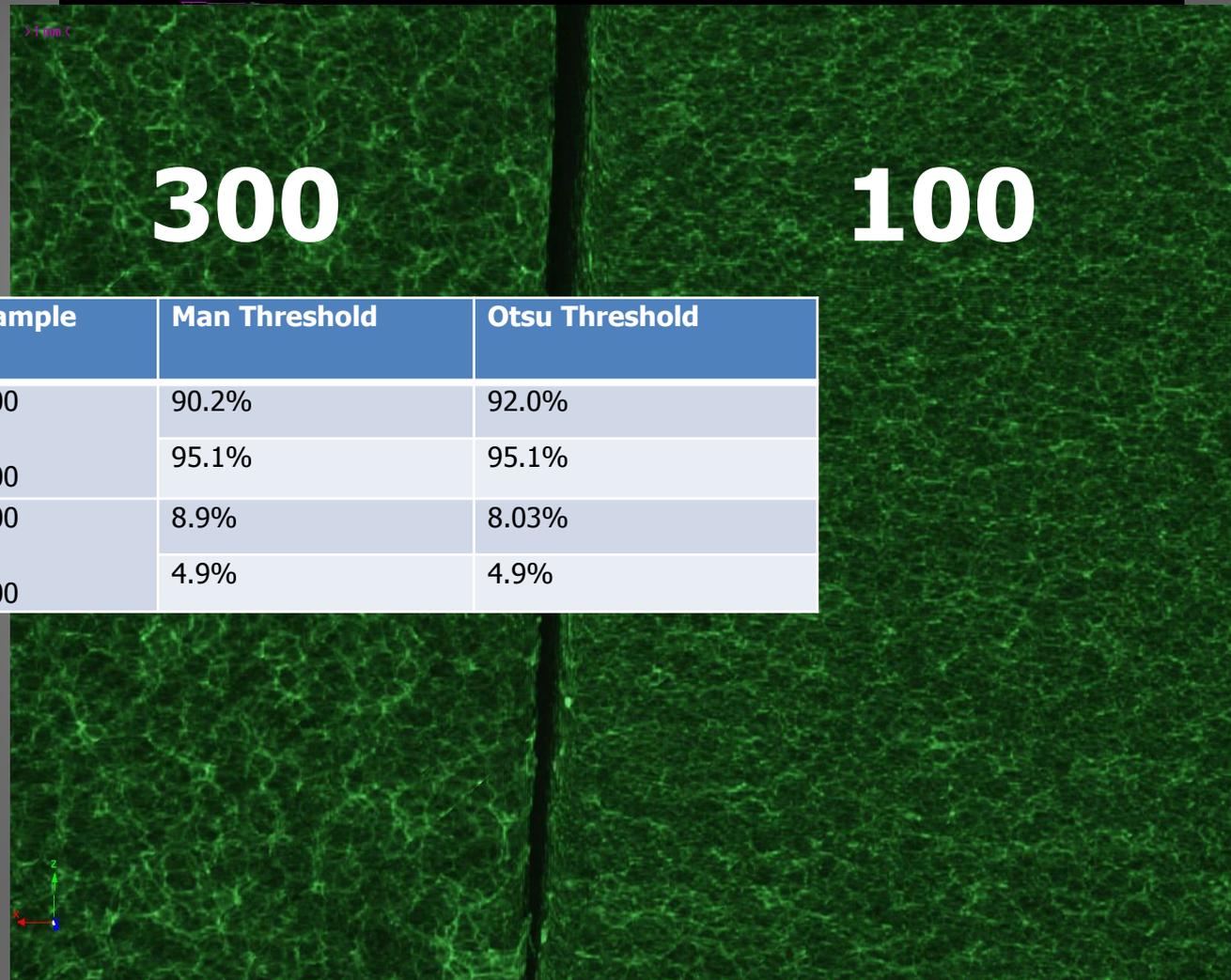
Index	Area [µm²]	Total (%)	Selected (%)
0	0.000	1.027E+010	100.000
1	0.041	3.766E+009	3.668
2	0.081	2.902E+009	2.842
3	0.121	1.799E+009	1.750
4	0.161	1.266E+009	1.242
5	0.201	8.070E+008	7.926
6	0.241	6.680E+008	6.577
7	0.281	5.076E+008	4.944
8	0.321	4.127E+008	4.024
9	0.361	3.621E+008	3.531
10	0.401	3.294E+008	3.224
11	0.441	3.017E+008	2.944

Parameters that can be measured in 2D and 3D:

- Object volume (pore, particle, etc.)
- Object surface
- Structure thickness
- Detailed analysis of porosity and object area/volume/surface/number
- Structure separation
- Euler number
- Degree of anisotropy
- Fractal dimension

Isolations Materiale 100 vs 300

Resolution = 4.26 μm
Voltage = 33 kV
Current = 204 μA



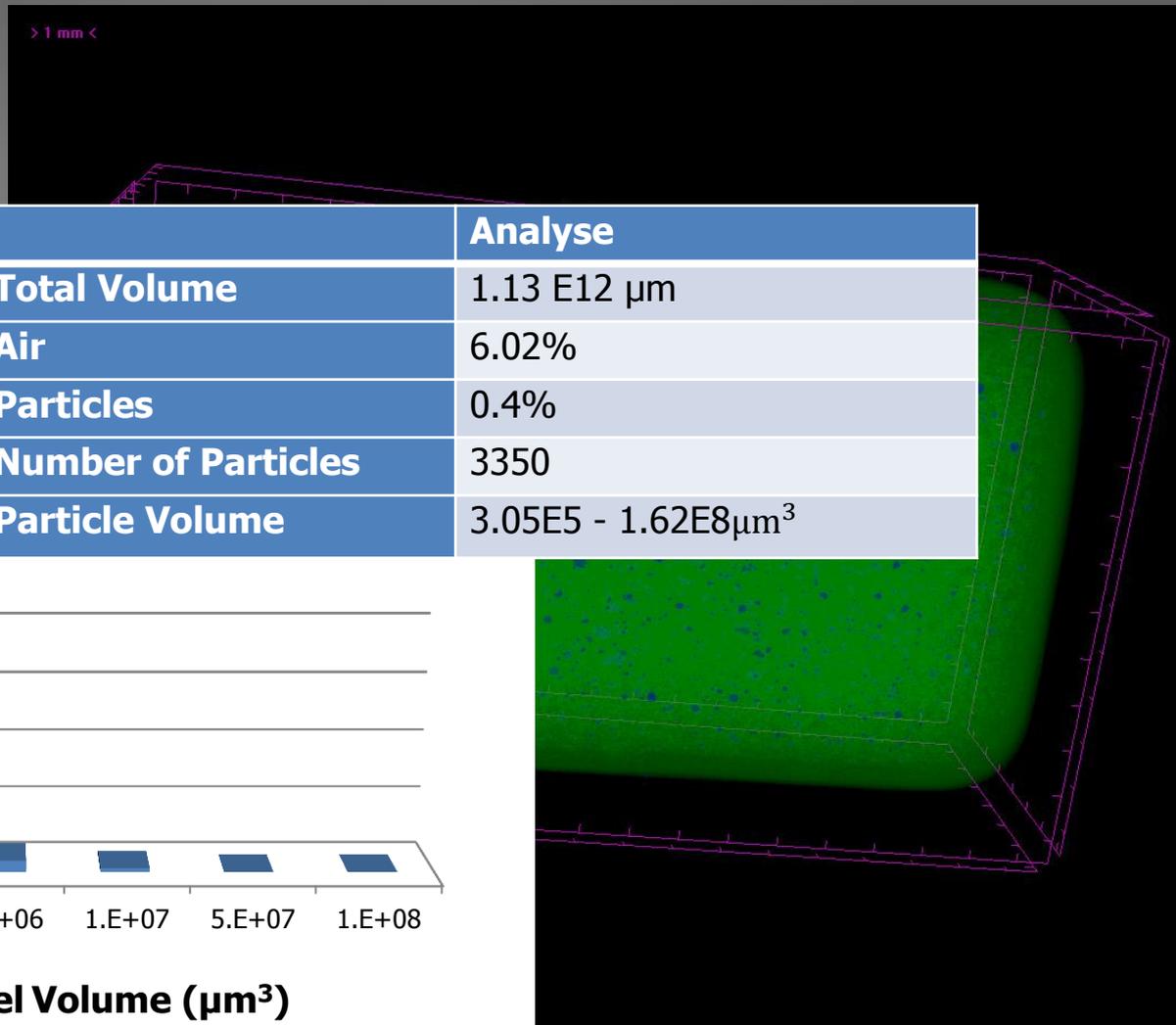
	Sample	Man Threshold	Otsu Threshold
Total Porosity	100	90.2%	92.0%
	300	95.1%	95.1%
Object Volume	100	8.9%	8.03%
	300	4.9%	4.9%

Tyggegummi



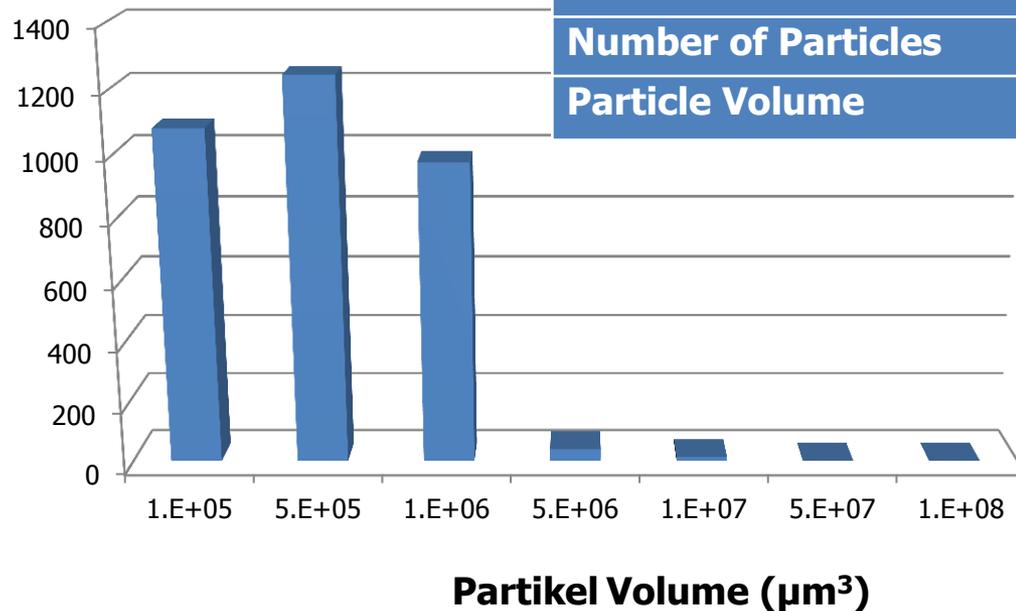
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Resolution = 6.66 μm
Voltage = 85 kV
Current = 118 μA
Filter = 0.5 Al



	Analyse
Total Volume	1.13 E12 μm^3
Air	6.02%
Particles	0.4%
Number of Particles	3350
Particle Volume	3.05E5 - 1.62E8 μm^3

Spredning I P



Fiber Prøve



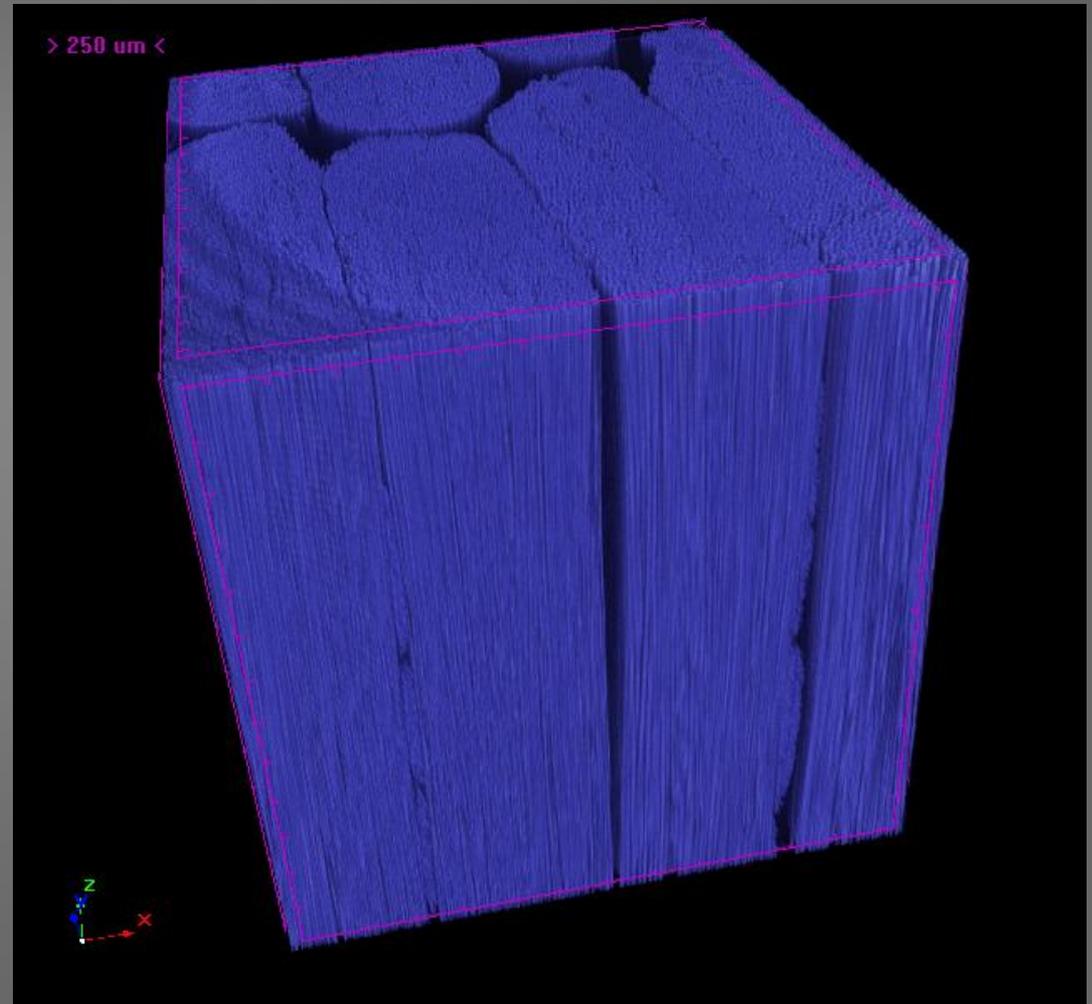
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Resolution = 1.60 μm

Voltage = 74 kV

Current = 133 μA

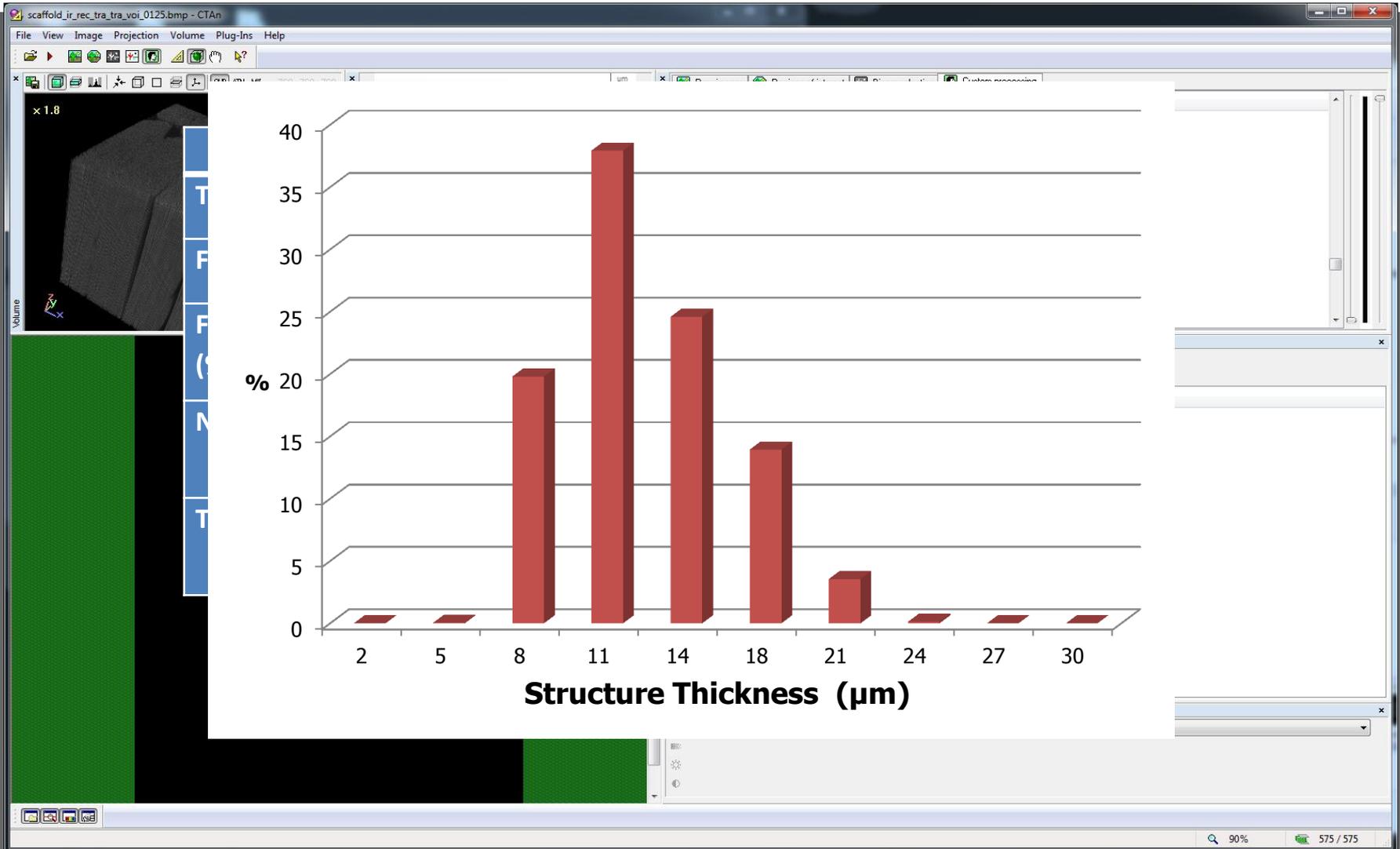
Filter = Al 0.5 mm



Fiber Prøve



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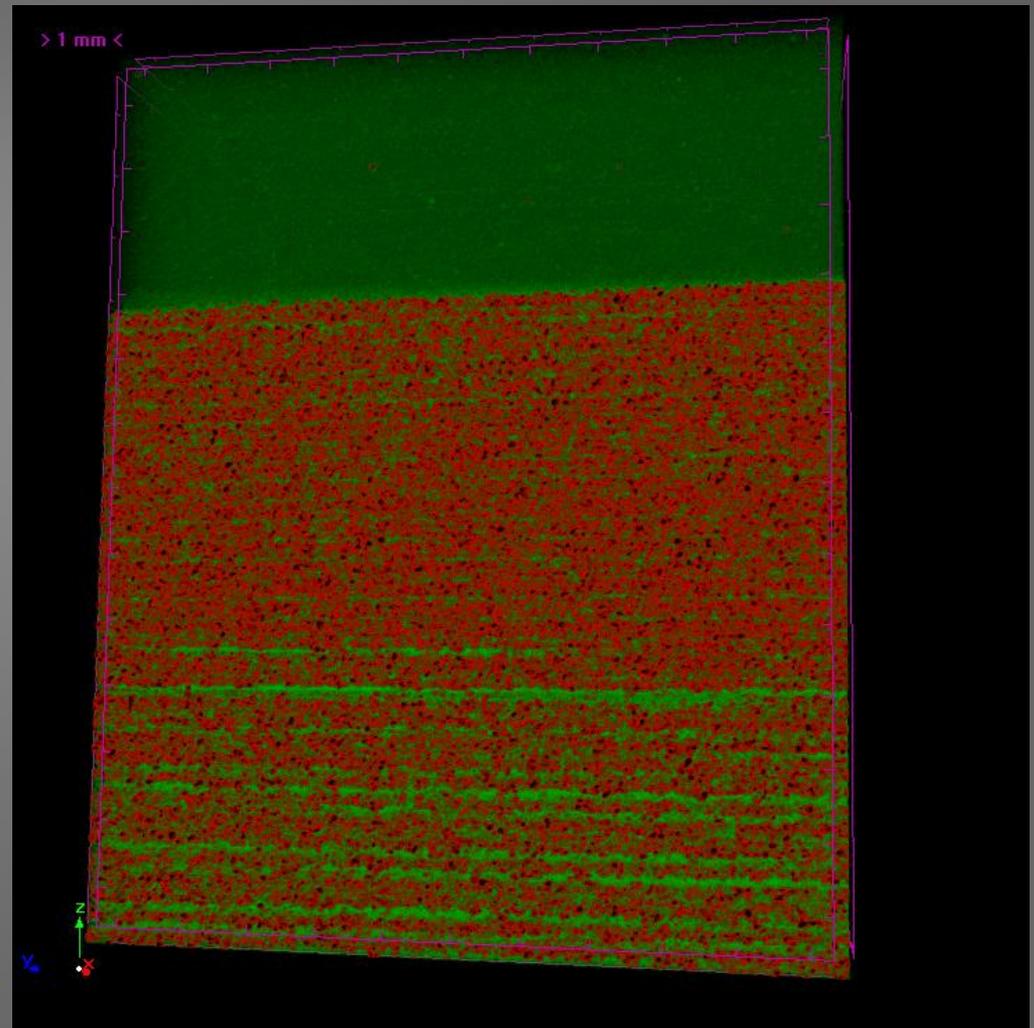
Polyamid (PA)/ Alumid



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Polyamide = 0.9 g/cm^3
Alumide = 1.36 g/cm^3

Resolution = $6.6 \text{ }\mu\text{m}$
Voltage = 48 kV
Current = $200 \text{ }\mu\text{A}$
Filter = 0.5 Al



Polyamid (PA) / Alumid



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test_ir_rec_voi_0148.bmp - CTAn

File View Volume Image Projection Histogram Help

Shadow protection

um

15000
13500
12000
10500
9000
7500
6000
4500
3000
1500
0

Raw images Binary selection

File name	Z-position
test_ir_rec_voi_0156.bmp	156 line (4.155 mm)
test_ir_rec_voi_0155.bmp	155 line (4.128 mm)
test_ir_rec_voi_0154.bmp	154 line (4.101 mm)
test_ir_rec_voi_0153.bmp	153 line (4.075 mm)
test_ir_rec_voi_0152.bmp	152 line (4.048 mm)
test_ir_rec_voi_0151.bmp	151 line (4.021 mm)
test_ir_rec_voi_0150.bmp	150 line (3.995 mm)
test_ir_rec_voi_0149.bmp	149 line (3.968 mm)
test_ir_rec_voi_0148.bmp	148 line (3.942 mm)

Dataset

Histogram

From image From dataset

25

80

60

40

20

8

20 40 60 80 100 120 140 160 180 200 220

Index

Grayscale indexes Attenuation coefficient

Index	(%)	Area (um ²)	Total (%)	Selected (%)
0	0.0%	1.8202E+009	2.838%	-
1	0.4%	2.2523E+008	0.351%	-
2	0.8%	2.2440E+008	0.350%	-
3	1.2%	2.3399E+008	0.365%	-
4	1.6%	2.5259E+008	0.394%	-
5	2.0%	2.7644E+008	0.431%	-
6	2.4%	3.0712E+008	0.479%	-
7	2.7%	3.5088E+008	0.547%	-
8	3.1%	4.2479E+008	0.662%	1.530%
9	3.5%	5.7095E+008	0.890%	2.057%

Palette

Original

161%

515 / 515

Tandstik



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Resolution = $1.33 \mu\text{m}$
Voltage = 40 kV
Current = $250 \mu\text{A}$
Porosity = 65 %

