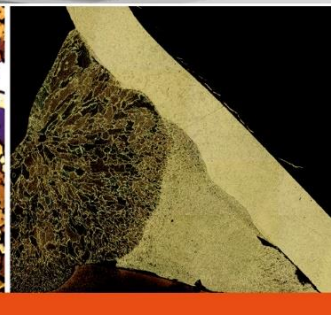
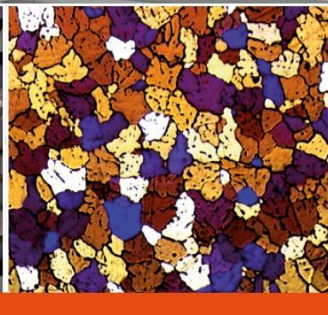
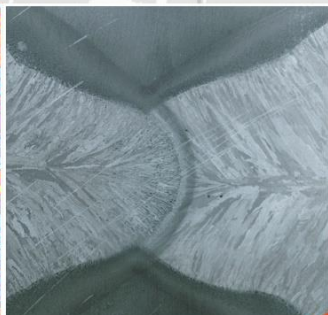
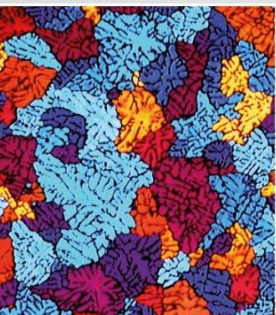


Application lab report

Preparation of various Al-alloys



QATM-Preparation method

Objective: This report includes the preparation of three samples (Figure 1). The sample D-022 (nitride layer) was not cut but mounted directly. The other 2 samples were Al-alloys (Sample Ext-Water: EN AW 6063; Sample-A: ADC-12) and were cut with QCUT 350 A. The samples were mounted with EPO-Black and ground/polished with QPOL 250 A1.

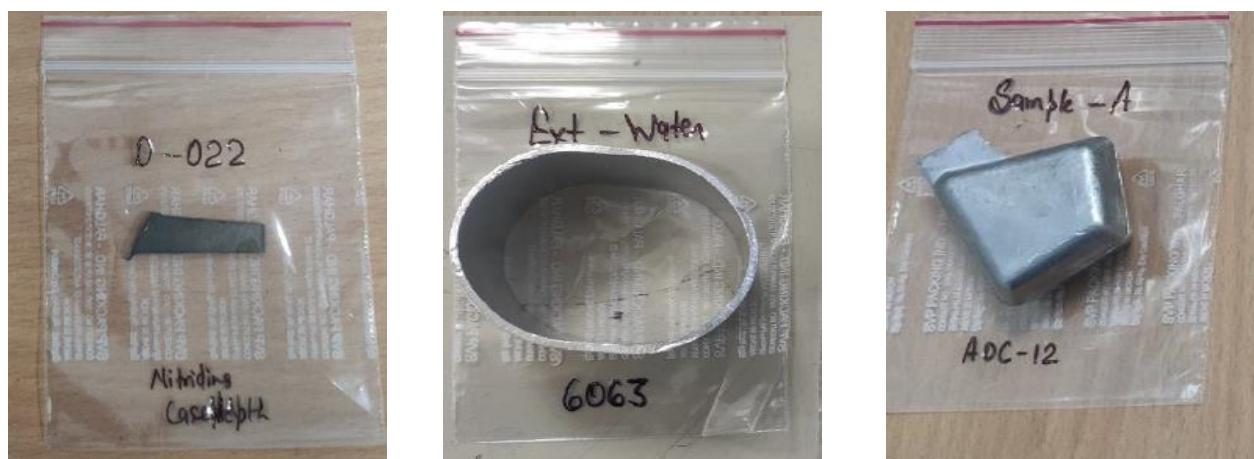


Figure 1: Overview of the samples.

QATM-Preparation method – D-022

Hot mounting

	MOUNTING				
Equipment	Consumable	Heating time	Temperature	Pressure	Cooling time
QPRESS 50	Epo-black	6:00	180°C	250 bar	4:00
Filler or additional consumable	Heating power	Pressure mode	Cooling power	Ø 40 mm	
-	100%	From beginning	100%		
Notes					



Figure 2: The mounted sample D-022.

QATM-Preparation method – D-022

Grinding/Polishing

Equipment	Sample holder	Pressure mode				
SAPHIR 550	Z5445025 6 x 40 mm	single				
Step	MEDIUM		 RPM		 N	 min
 Grinding	SiC P320 self-adhesive + X-TAP	H ₂ O	200	120 ▶▶	25	Till plan (2:00)
 Grinding	SiC P600 self-adhesive + X-TAP	H ₂ O	200	120 ▶▶	25	0:45
 Grinding	SiC P600 self-adhesive + X-TAP	H ₂ O	200	120 ▶▶	25	0:45
 Polishing	GAMMA	Diamondsus. Poly, 3 µm + Lubricant (alc.)	150	120 ▶▶	25	5:00
 Polishing	ZETA	Diamondsus. Poly, 1 µm + Lubricant (alc.)	150	120 ▶▶	22	3:00
 Etching	Nitric acid (alc. 3%)					0:10

Notes

- Pre-dosing for 3 µm and 1 µm: 3 s
Dosing interval and dosing duration for Dia. Suspension 3µm, 1µm:
Every 30 s for 1,3 s
- Dosing interval and dosing duration for lubricant:
Every 60 s for 1,3 s

QATM-Preparation method – D-022



Figure 3: The nitride coating after etching under optical microscope – 100 x

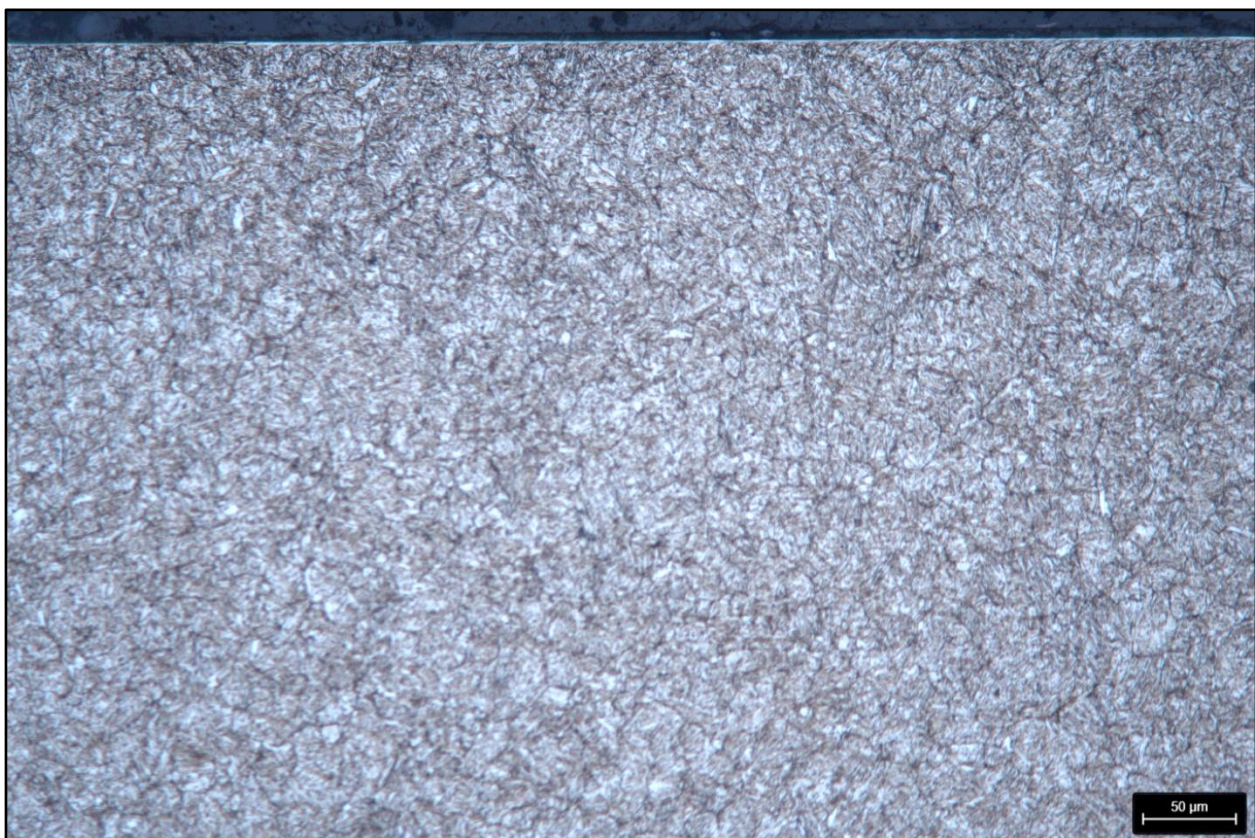


Figure 4: The nitride coating after etching under optical microscope – 200 x

QATM-Preparation method – D-022

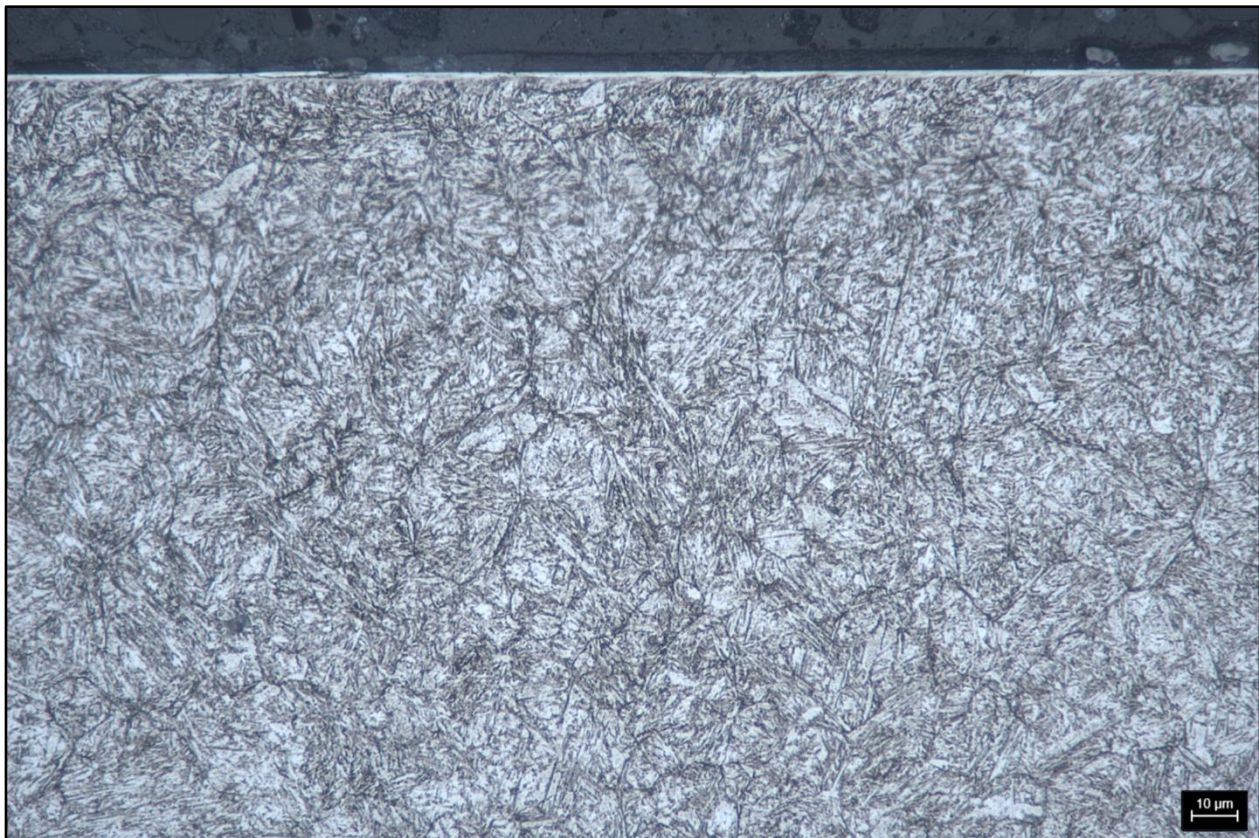


Figure 5: The nitride coating after etching under optical microscope – 500 x

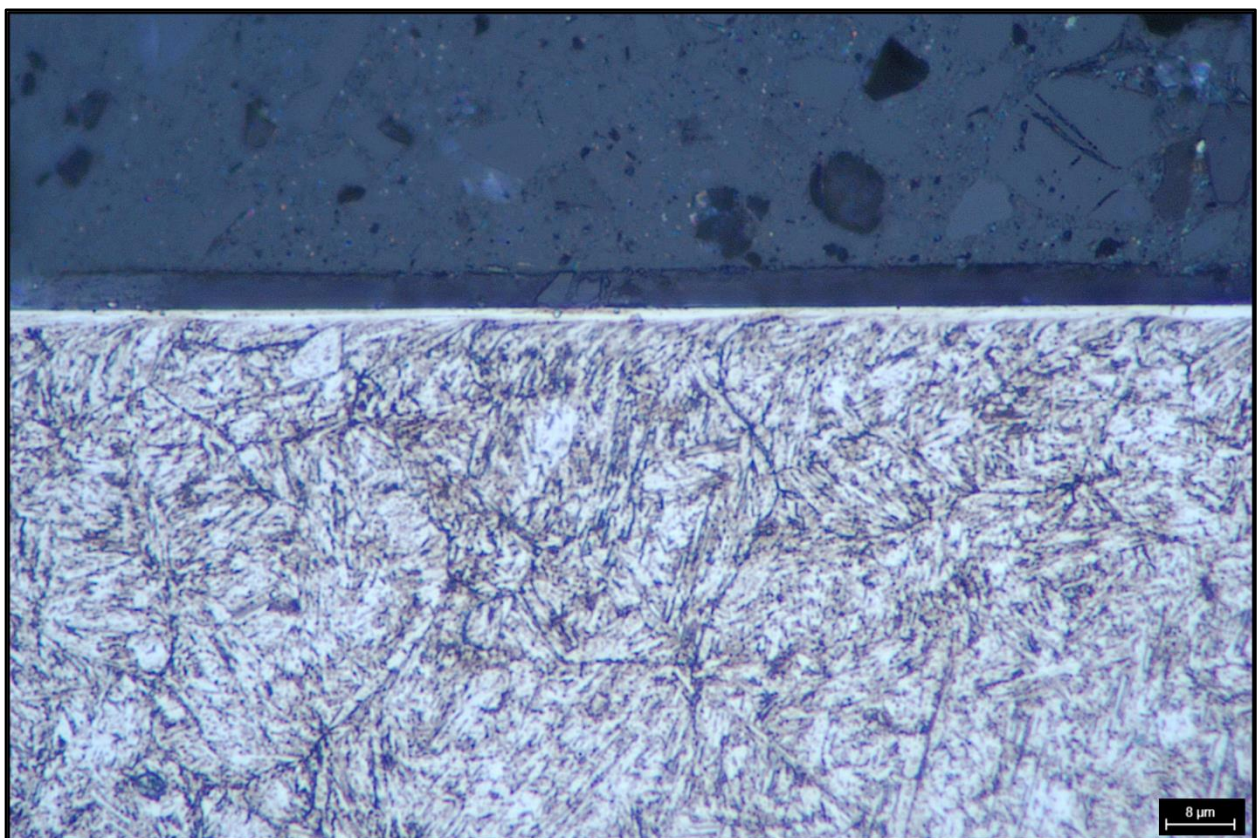


Figure 6: The nitride coating after etching under optical microscope – 1000 x

QATM-Preparation method – Sample A

Cutting

 CUTTING			
Equipment	Cut-off wheel	Anti-corrosion coolant	Clamping tool
Qcut 350 A	NF-A cut-off disc	QATM – Standard (95014282)	Qtool 80
Cutting method			
Horizontal cut (X-axis)			
Parameters			
Feed speed	Pulse parameter	Rotational speed	
0,1 mm/s	Without pulse	2500 RPM	
Notes			



Figure 7: The cutting layout of sample A and different parts after cutting.

QATM-Preparation method – Sample A

Hot mounting

	MOUNTING				
Equipment	Consumable	Heating time	Temperature	Pressure	Cooling time
QPRESS 50	Epo-black	6:00	180°C	250 bar	4:00
Filler or additional consumable	Heating power	Pressure mode	Cooling power	Ø 40 mm	
-	100%	From beginning	100%		
Notes					



Figure 8: Parts 2 and 3 of sample A in figure 5 after mounting.

QATM-Preparation method – Sample A

Grinding/Polishing

Equipment	Sample holder	Pressure mode				
QPOL 250 A1	Z5445025 6 x 40 mm	single				
Step	MEDIUM		 RPM		 N	 min
 Grinding	SiC P320 paper + Quick-Tap	H ₂ O	200	120 ▶▶	25	Till plan (2:00)
 Grinding	SiC P600 paper + Quick-Tap	H ₂ O	200	120 ▶▶	25	0:45
 Grinding	SiC P1200 paper + Quick-Tap	H ₂ O	200	120 ▶▶	25	0:45
 Polishing	SIGMA	Diamondsus. Poly, 3 µm + Lubricant (alc.)	150	120 ▶▶	25	5:00
 Polishing	ZETA	Diamondsus. Poly, 1 µm + Lubricant (alc.)	150	120 ▶▶	22	3:00
 Etching	Kroll					0:30

Notes

- Pre-dosing for 3 µm and 1 µm: 3 s
Dosing interval and dosing duration for Dia. Suspension 3µm and 1µm: Every 30 s for 1,3 s
- Dosing interval and dosing duration for lubricant:
Every 60 s for 13 s

QATM-Preparation method – Sample A

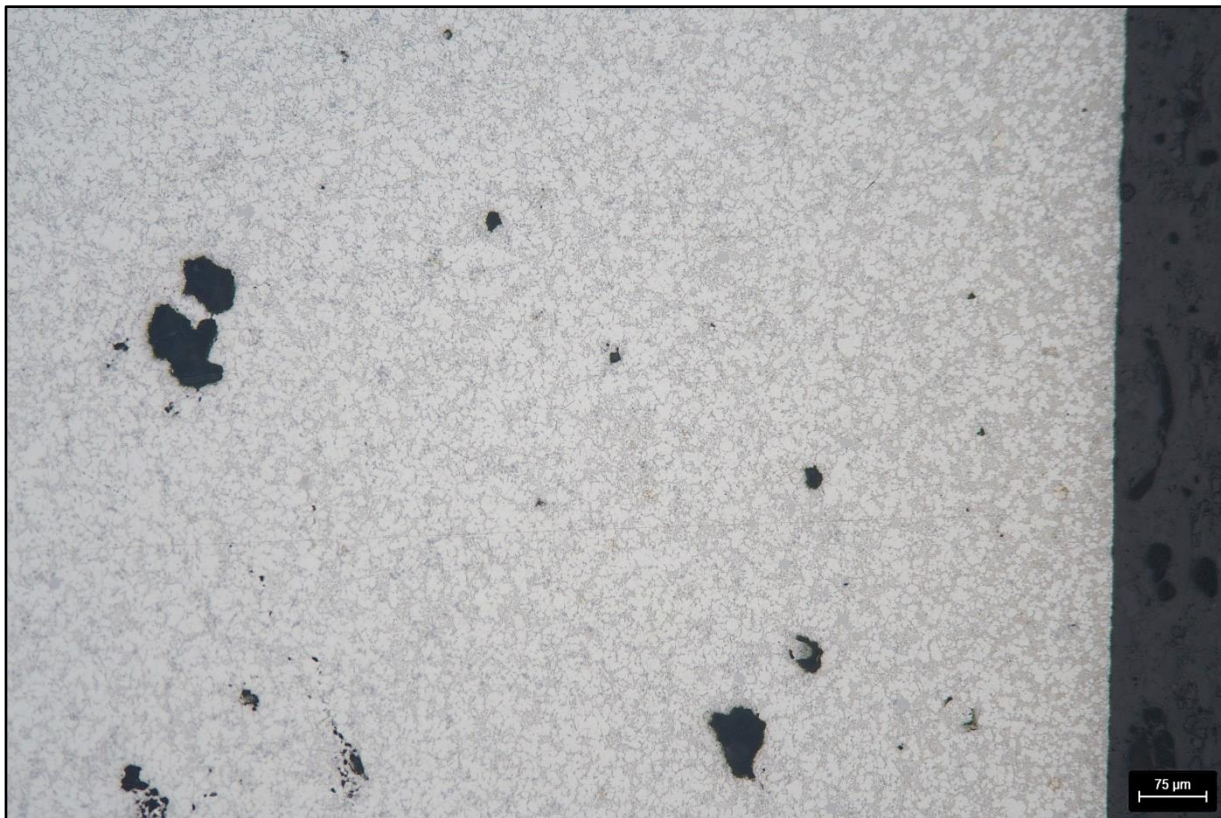


Figure 9: Overview of the surface region – 100 x

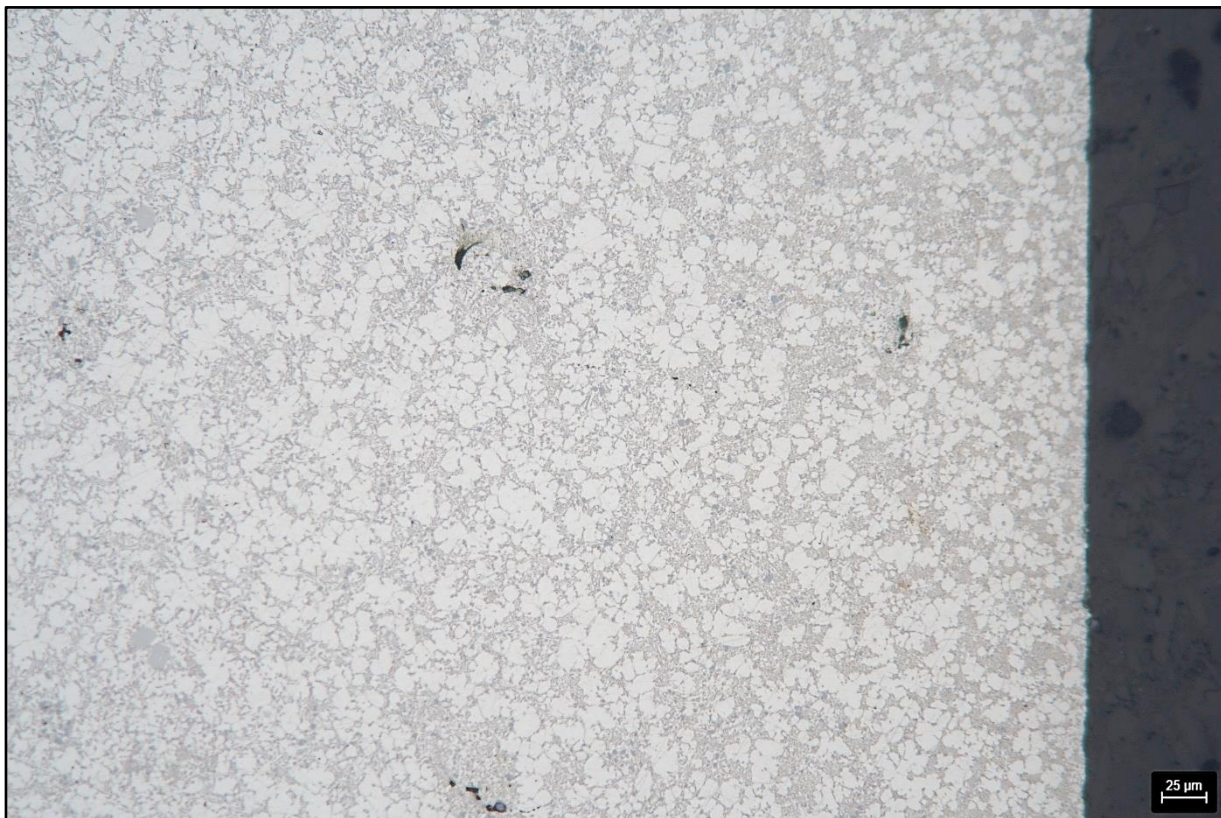


Figure 10: Microstructure of sample A after 1 μm – 200 x

QATM-Preparation method – Sample A

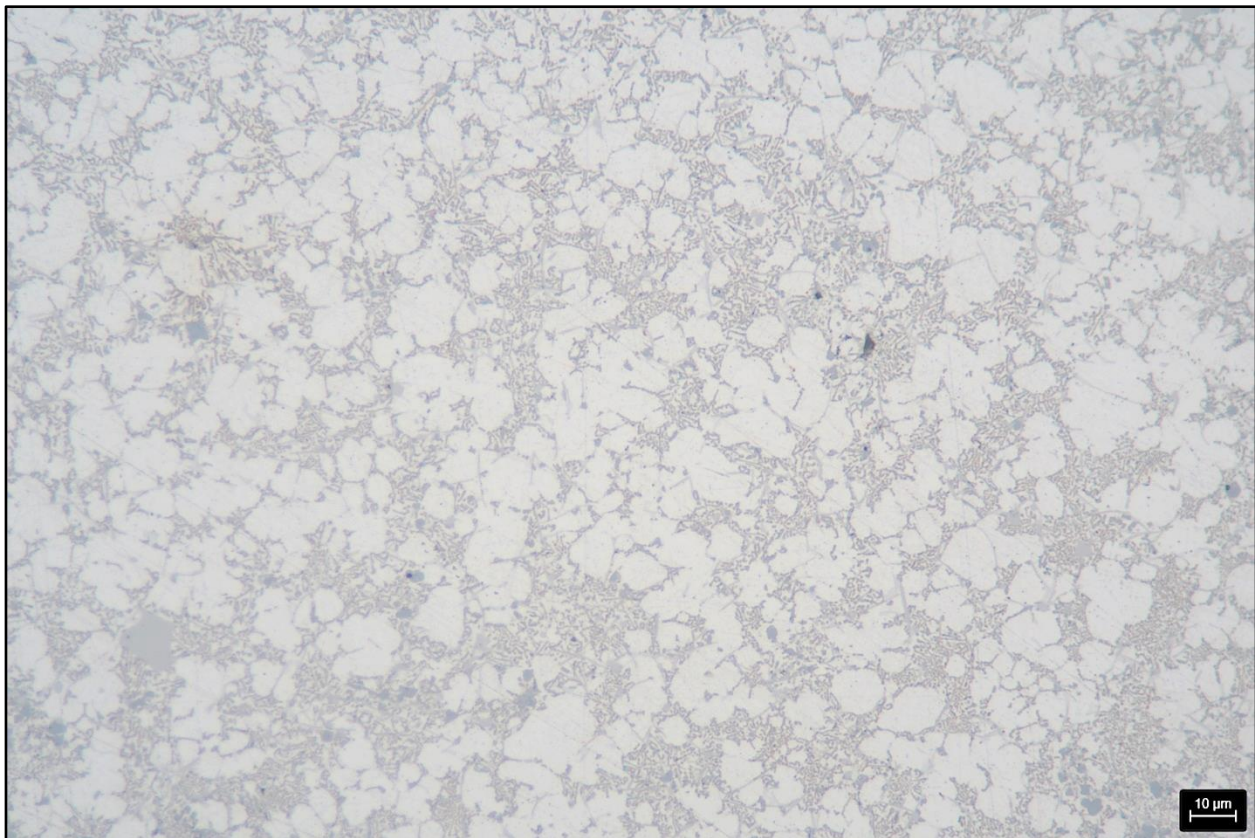


Figure 11: Microstructure of sample A after 1 µm – 500 x

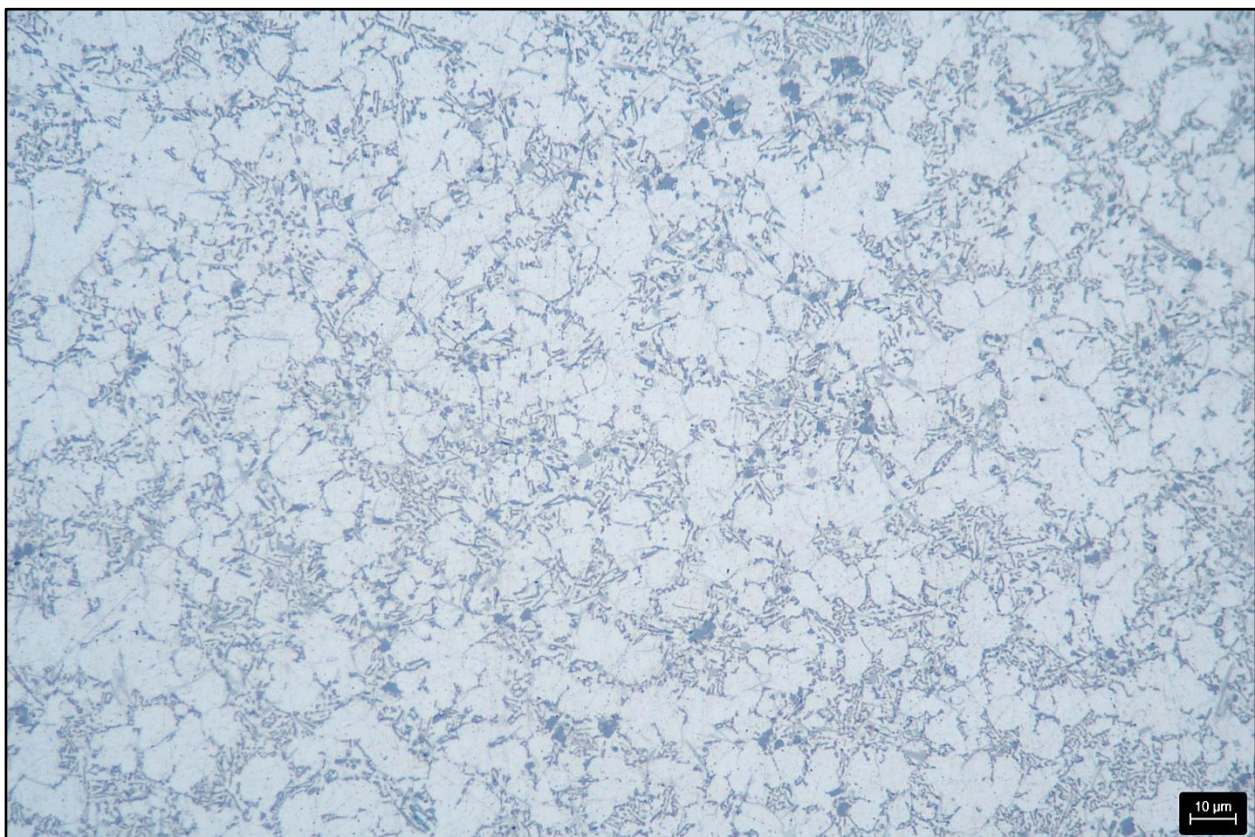


Figure 12: Microstructure of sample A after 1 µm – 500 x

QATM-Preparation method – Sample A

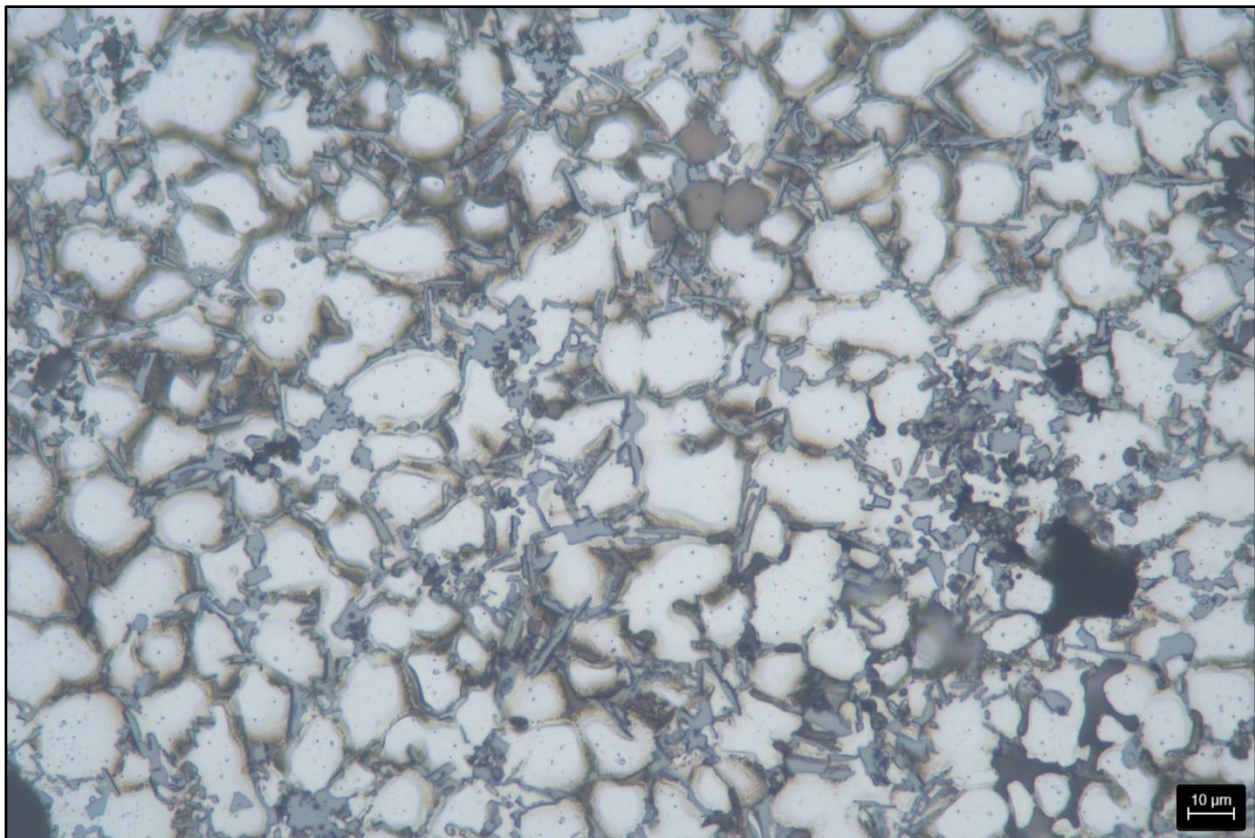


Figure 13: The microstructure after etching with Kroll for 30 s – 500 x

QATM-Preparation method – EXT-Water

Cutting

 CUTTING			
Equipment	Cut-off wheel	Anti-corrosion coolant	Clamping tool
Qcut 350 A	NF-A cut-off disc	QATM – Standard (95014282)	Qtool 80
Cutting method			
Horizontal cut (X-axis)			
Parameters			
Feed speed	Pulse parameter	Rotational speed	
0,1 mm/s	Without pulse	2500 RPM	
Notes			

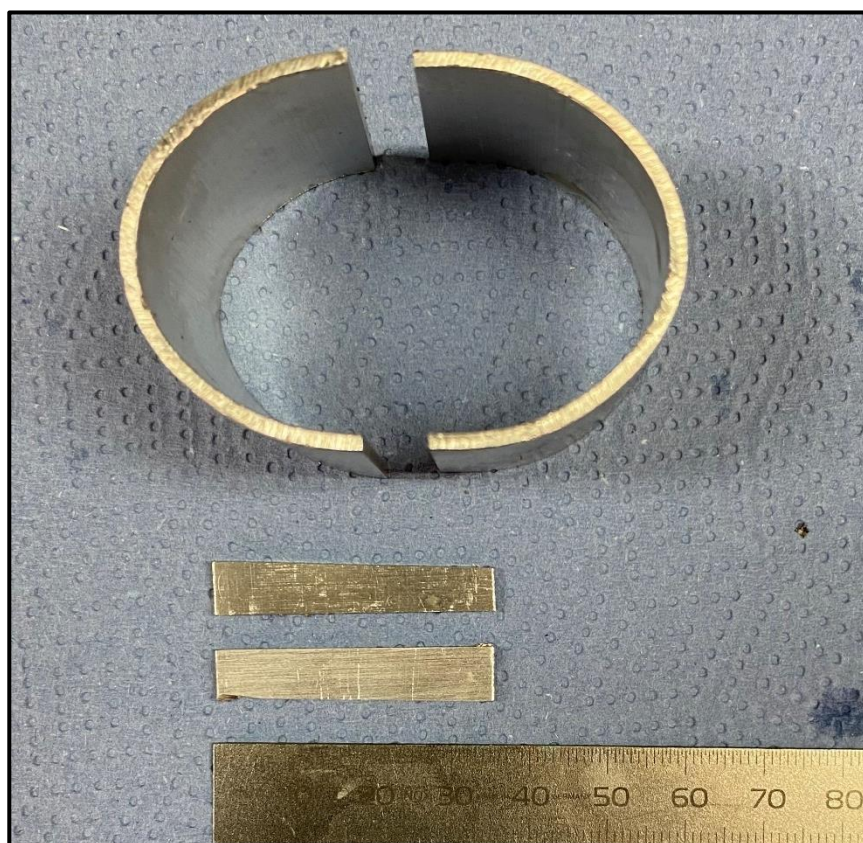


Figure 14: The "Ext- Water" sample after cutting.

QATM-Preparation method – EXT-Water

Hot mounting

	MOUNTING				
Equipment	Consumable	Heating time	Temperature	Pressure	Cooling time
QPRESS 50	Epo-black	6:00	180°C	250 bar	4:00
Filler or additional consumable	Heating power	Pressure mode	Cooling power	Ø 40 mm	
-	100%	From beginning	100%		
Notes					



Figure 15: The cut samples were mounted in cross-section and lengthwise.

QATM-Preparation method – EXT-Water

Grinding/Polishing

Equipment	Sample holder	Pressure mode					
QPOL 250 A1	Z5445025 6 x 40 mm	single					
Step	MEDIUM		 RPM		 N	 min	
 Grinding	SiC P320 paper + Quick-Tap	H ₂ O	200	120 ▶▶	25	Till plan (2:00)	
 Grinding	SiC P600 paper + Quick-Tap	H ₂ O	200	120 ▶▶	25	0:45	
 Grinding	SiC P1200 paper + Quick-Tap	H ₂ O	200	120 ▶▶	25	0:45	
 Polishing	SIGMA	Diamondsus. Poly, 3 µm + Lubricant (alc.)	150	120 ▶▶	25	5:00	
 Polishing	ZETA	Diamondsus. Poly, 1 µm + Lubricant (alc.)	150	120 ▶▶	22	3:00	
 Etching	Electrolytic Barker or Kroll					1:10 or 0:30	

Notes

- Pre-dosing for 3 µm and 1 µm: 3 s
Dosing interval and dosing duration for Dia. Suspension 3µm and 1µm: Every 30 s for 1,3 s
- Dosing interval and dosing duration for lubricant:
Every 60 s for 13 s

QATM-Preparation method – EXT-Water

Electrolytic polishing and etching

Device					
QETCH 1000					
Step	Electrolyte	Voltage [V]	Pumping power [%]	Mask [cm ²]	Duration [min]

Electrolytic Etching

 Etching (electrolytic)	Barker	22	55	1,5	1:10
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Notes

QATM-Preparation method – EXT–Water



Figure 16: The Ext-Water sample after 1 µm polishing, not etched – 100 x



Figure 17: The Ext-Water sample after 1 µm polishing, not etched – 200 x

QATM-Preparation method – EXT–Water

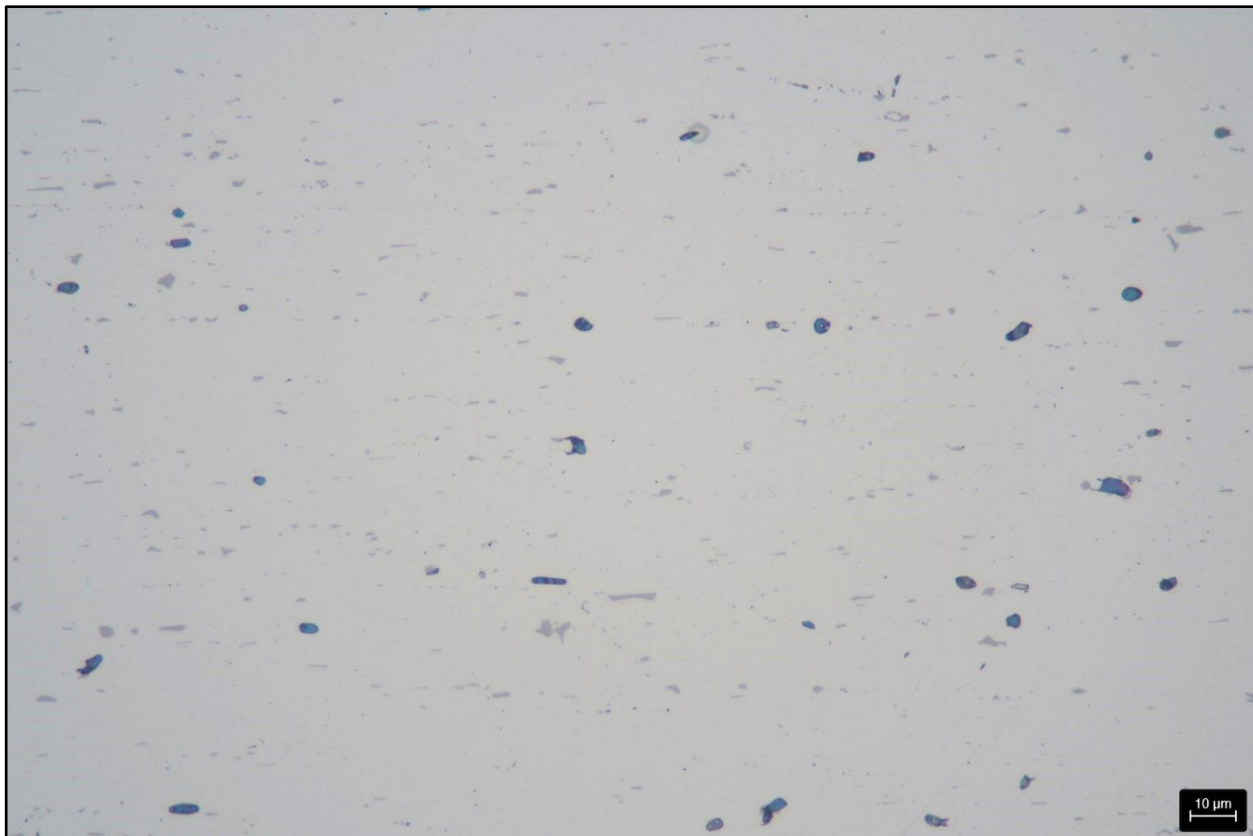


Figure 18: The Ext-Water sample after 1 µm polishing, not etched – 500 x

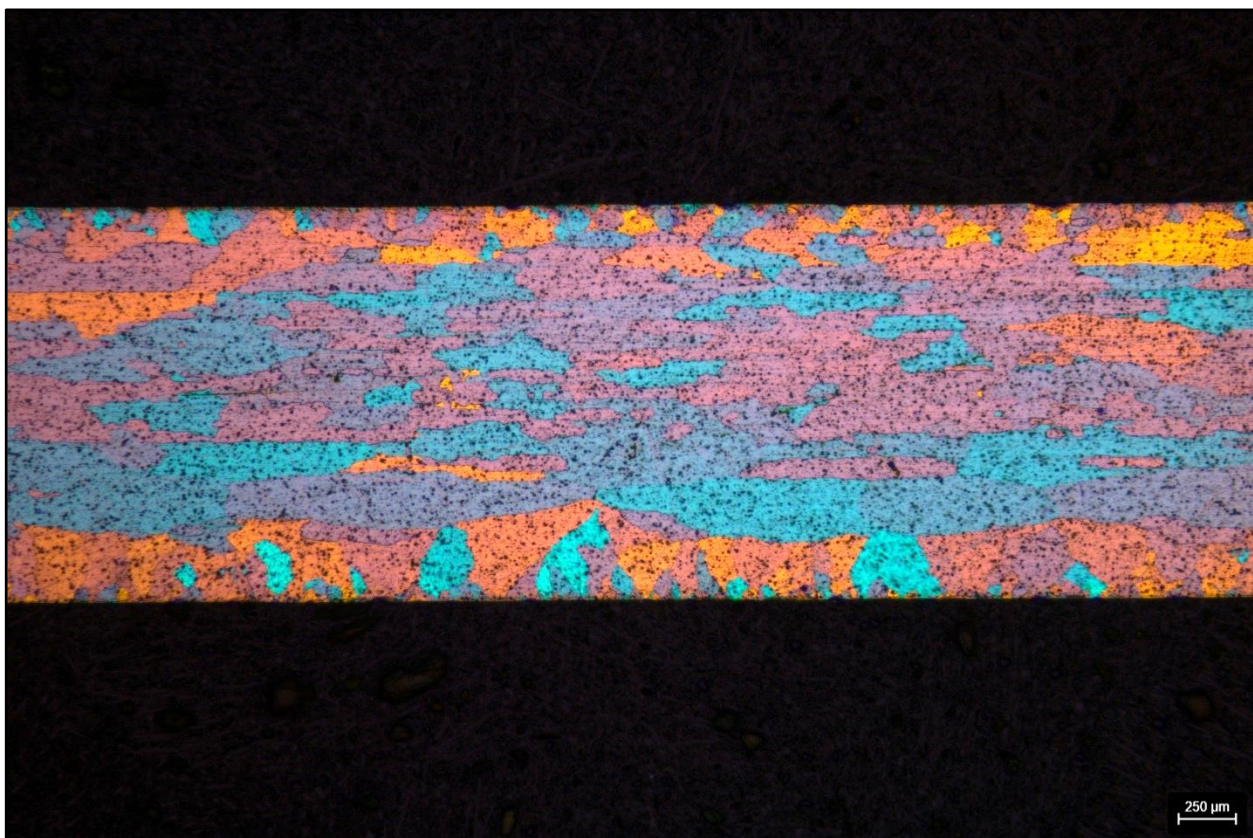


Figure 19: The Ext-Water sample after normal grinding/polishing and electrolytic etching – 25 x

QATM-Preparation method – EXT–Water

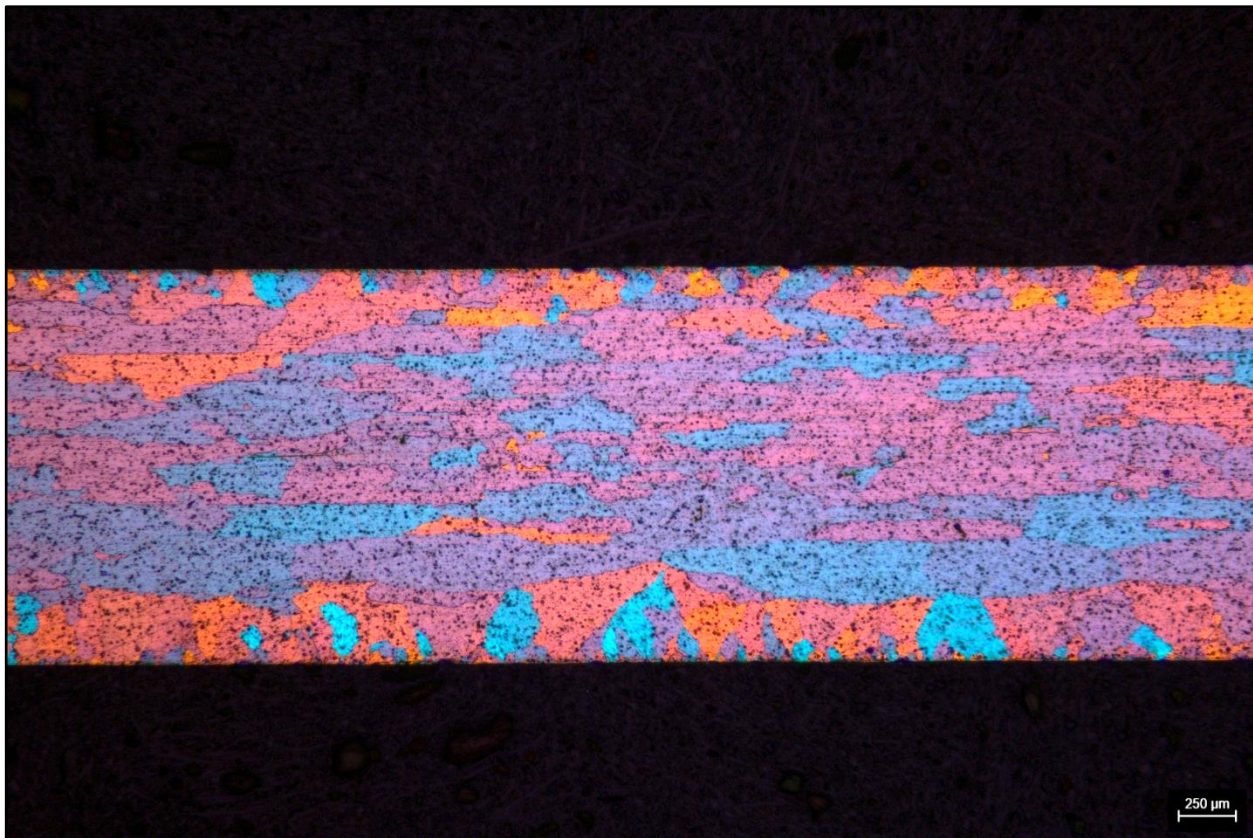


Figure 20: The Ext-Water sample after normal grinding/polishing and electrolytic etching – 25 x



Figure 21: The Ext-Water sample after normal grinding/polishing and electrolytic etching – 100 x

QATM-Preparation method – EXT–Water

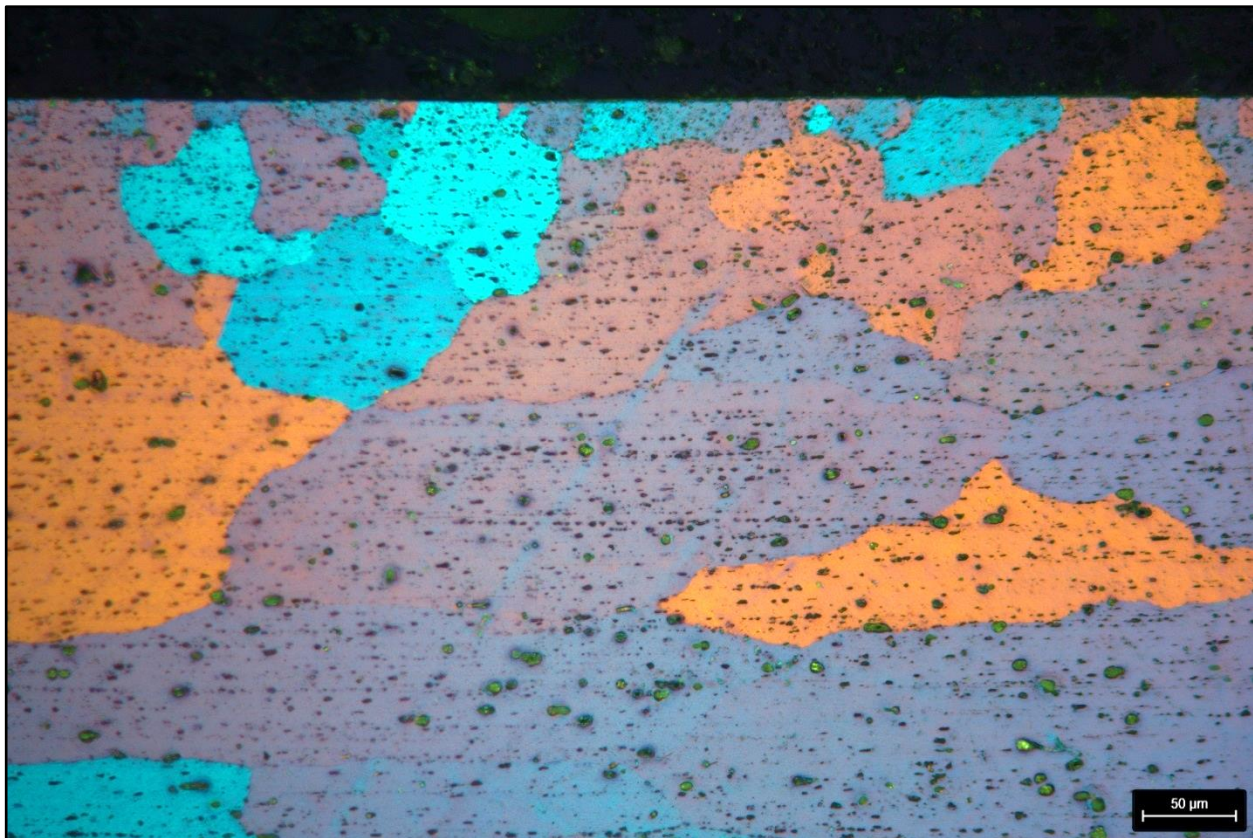


Figure 22: The Ext-Water sample after normal grinding/polishing and electrolytic etching – 200 x

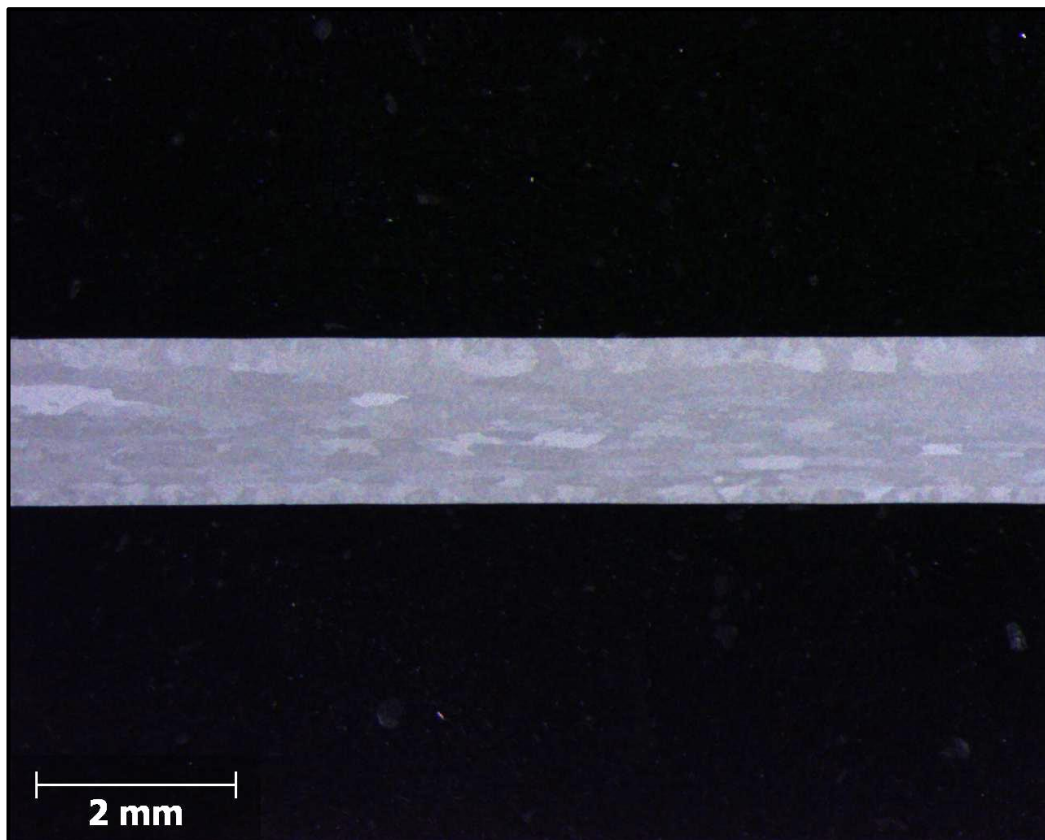


Figure 23: The Ext-Water sample after normal grinding, polishing and etching with Kroll under stereo microscope– 16 x

QATM-Preparation method – EXT–Water

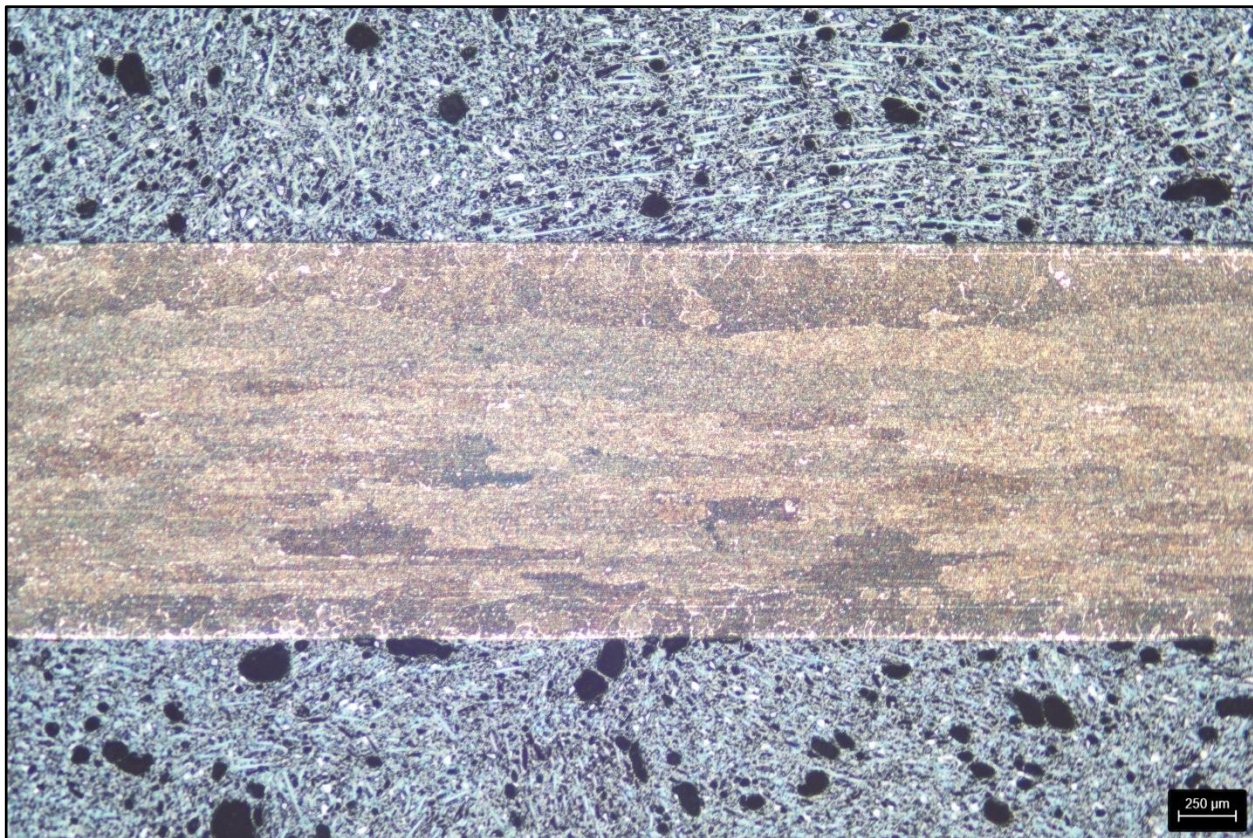


Figure 24: The Ext-Water sample after normal grinding, polishing and etching with Kroll – 25 x

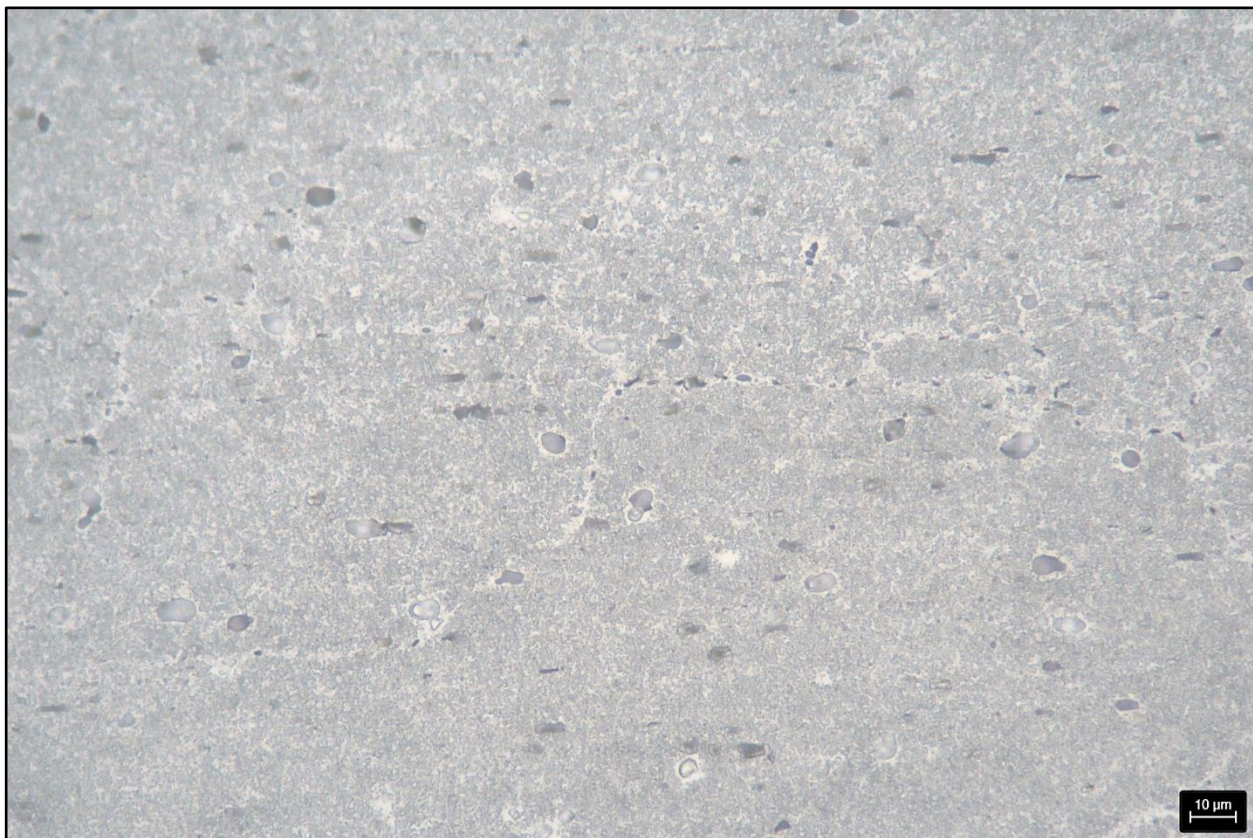


Figure 25: The Ext-Water sample after normal grinding, polishing and etching with Kroll – 500 x