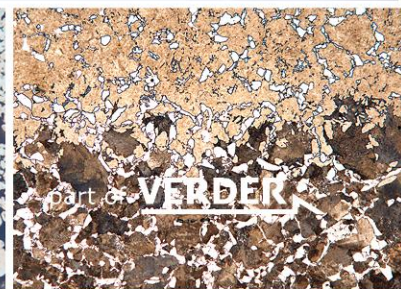
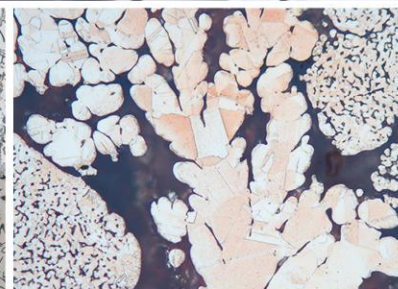
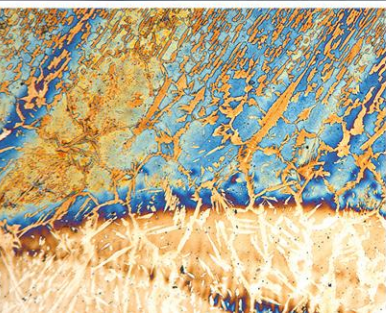


Application lab. report

Pure aluminum

Preparation of pure aluminum



part of **VERDER**

QATM-Preparation method

Objective:

The aim of the investigation is to determine a suitable preparation method for sample of pure aluminum.



Figure 1. As received sample1



Figure 2. As received sample2

QATM-Preparation method

Cutting

 Cutting			
Device	Cut-off disc	Anti-corrosion coolant	Clamping tool
QCUT 250 M	Al ₂ O ₃ cut-off disc NF-A 250	Coolant, Standard	QTOOL 60
Cutting method			
Manuel vertical cutting method (with Y-Axis)			
Parameters			
Feed speed	Pulse parameter	Cut-off disc rotational speed	
Manuel	-	Standard 2850 rpm	
Notes			
Even though the material is very easy to cut, it should still be cut gently to avoid the deformation on the surface of the sample.			

QATM-Preparation method

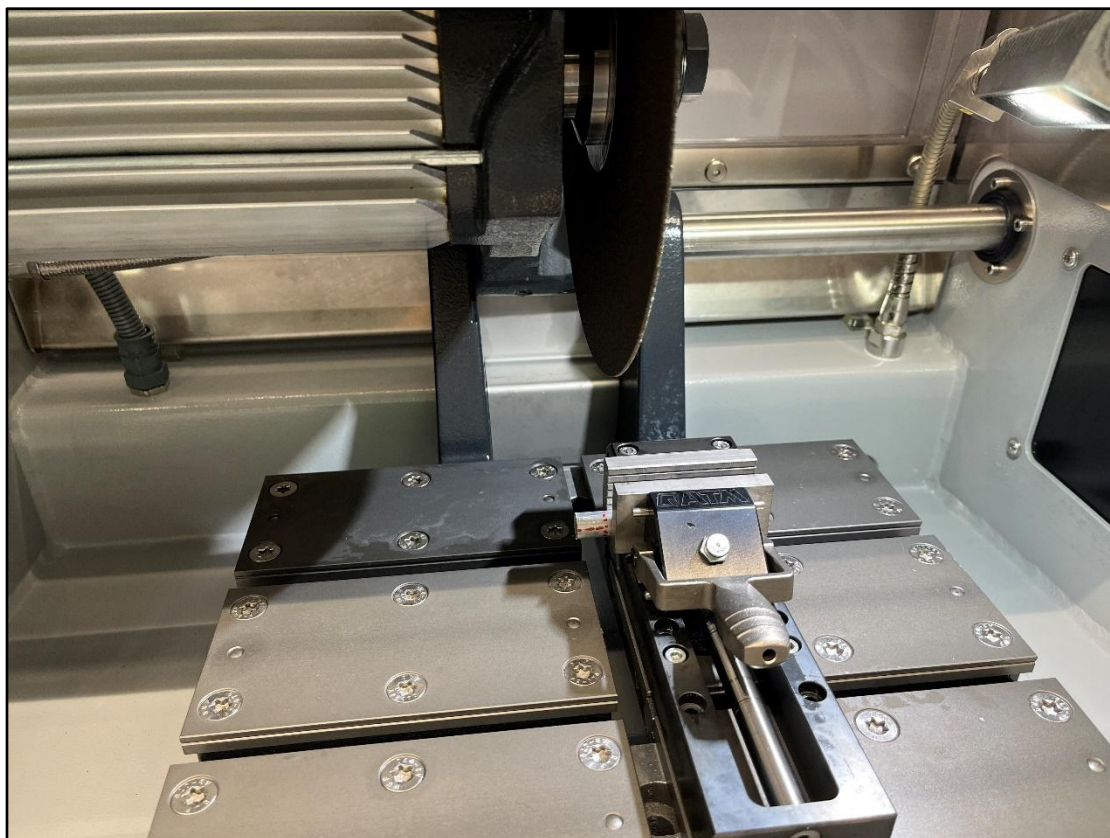


Figure 3. Clamping overview of the sample

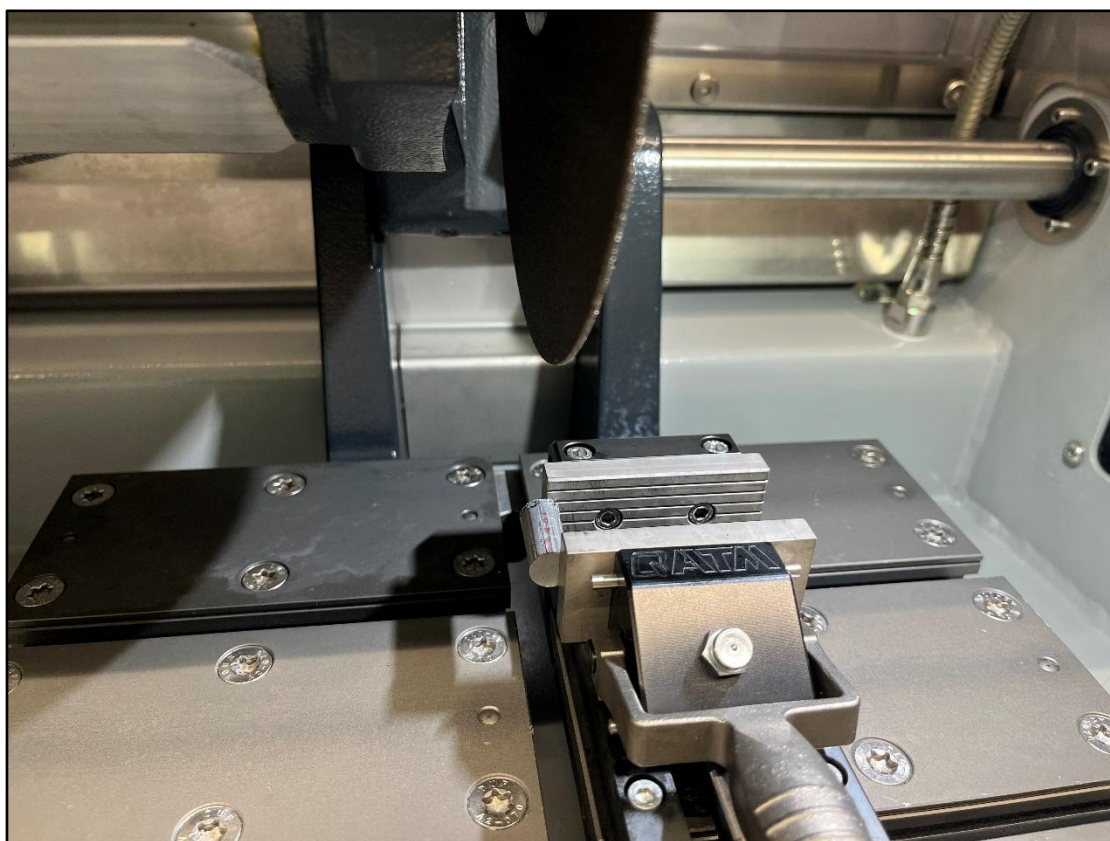


Figure 4. Clamping overview of the sample.

QATM-Preparation method



Figure 5. Sample 1 after cutting

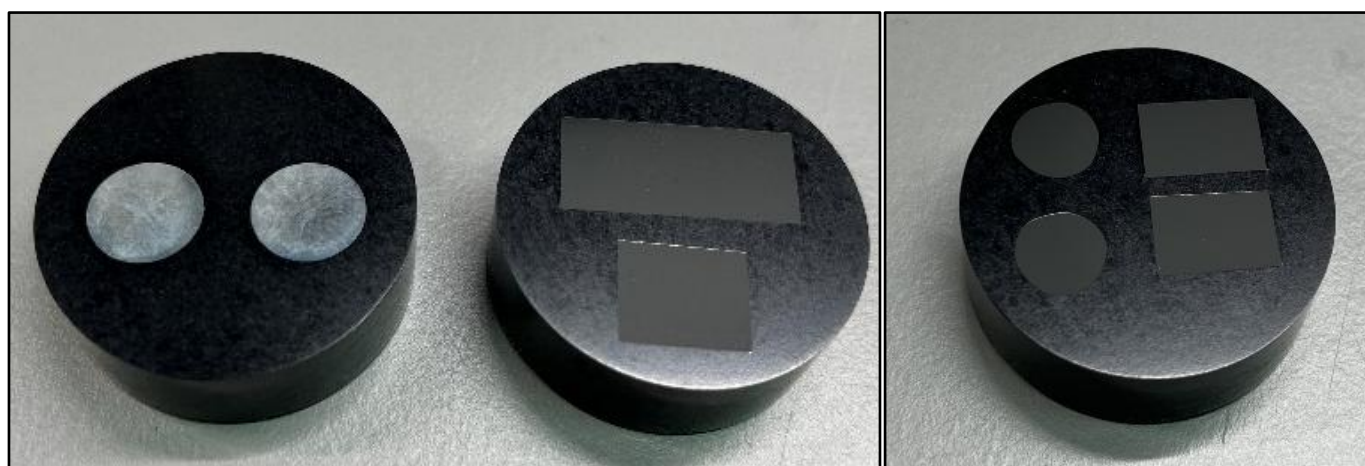


Figure 6. Sample 2 after cutting.

QATM-Preparation method

Hot mounting

 Mounting					
Device	Consumable	Heating time	Temperature	Pressure	Cooling time
QPRESS 40	Bakelite black	4:45 min.	200 °C	250 bar	3:30 min.
Filler or additional consumables	Heating power	Pressure mode	Cooling power	Piston with ø 40 mm	
-	100%	1 level mode	100%		
Notes					
Deburr and clean the samples before mounting.					



Sample 1

Sample 2

Figure 7. The samples after hot mounting

QATM-Preparation method

Grinding/Polishing

Device	Samples holder	Pressure mode				
QPOL 250 A Eco	Z5445025	Single				
Step	MEDIUM		 RPM	 N	 min	
 Grinding	SiC-Paper P600 (400)	H ₂ O	200	100 ◀ ▶	20	1:00
 Grinding	SiC-Paper P1200 (600)	H ₂ O	200	100 ▶ ▶	20	1:00
 Polishing	SIGMA	Dia. suspension Poly, 3µm + alc. Lubricant	150	100 ▶ ▶	30	6:00
 Polishing	ZETA	Dia. suspension Poly, 1µm + alc. Lubricant	150	100 ▶ ▶	22	2:00
 Fine polishing	OMEGA	Eposil F 0,1µm	100	80 ◀ ▶	20	2:00 (Rinsing time: 30 s)
 Etching (chem.)	Etchant Sodium hydroxide					4:00-6:00

Notes

- Pre-dosing for 3 µm und 1 µm: 3 s
Dosing interval and dosing duration for Dia. Suspension 3µm, 1µm:
Every 45 s for 1,3 s
- Dosing interval and dosing duration for lubricant:
Every 60 s for 1,3 s
- Dosing interval and Dosing duration for fine polishing suspension:
Manuel every 20 s for 1,3 s

QATM-Preparation method



Figure 8. Sample 2 after fine polishing on the edge area – 100:1

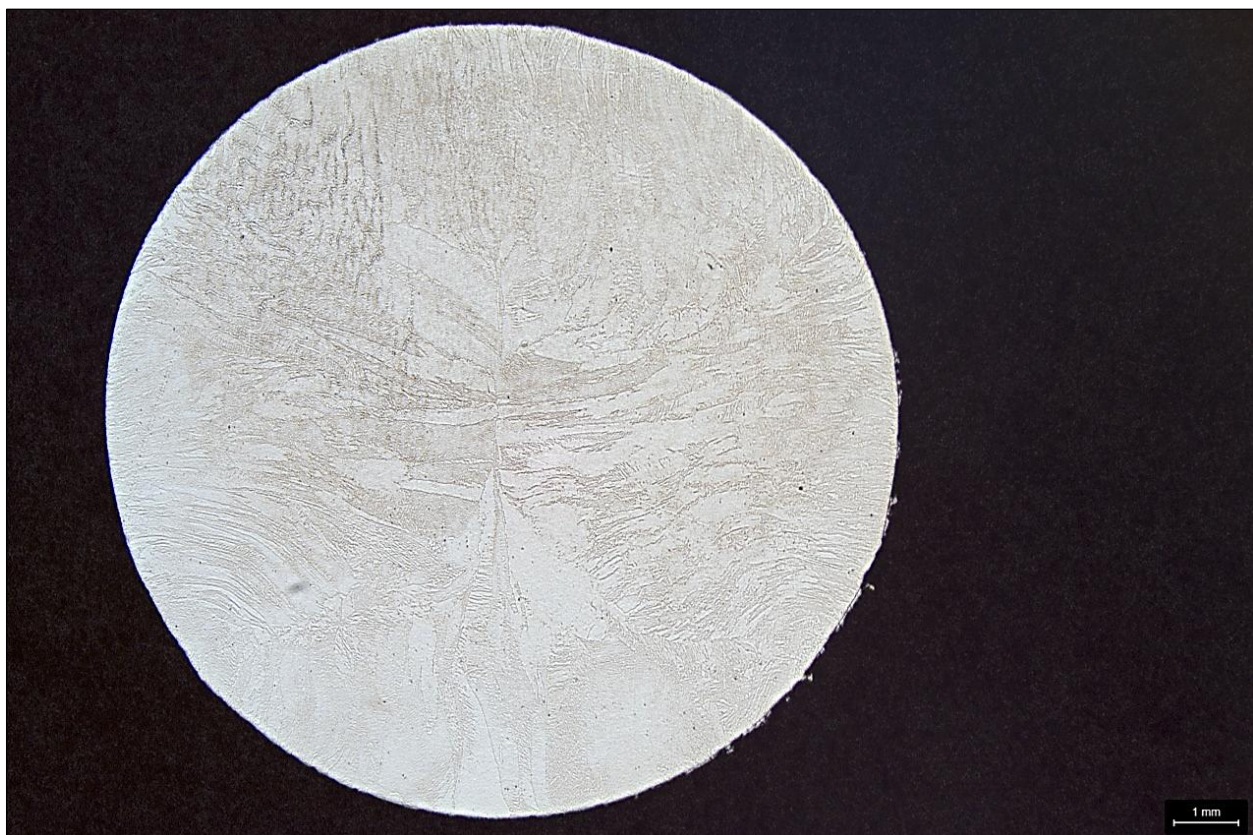


Figure 9. Sample 1 after etching for 4 minutes – 7:1

QATM- Preparation method



Figure 10. Sample 2 after etching for 6 minutes – 7:1



Figure 11. Sample 2 after etching for 4 minutes – longitudinal section - 25:1

QATM- Preparation method



Figure 12. Sample 2 after etching for 4 minutes – cross section – 25:1

QATM- Preparation method

Conclusion:

1. The samples can be clamped and cut without any problem. the clamping force should be considered.
2. The samples were mounted using the QPRESS 40 hot mounting press. The hot mounting medium Bakelite black was used.
3. The preparation method was adapted to minimize deformation. If the samples are deformed during the metallographic preparation, the grain boundaries can not be seen after etching. Here using the right parameter such as force during the grinding and the polishing is vital.
4. The samples were etched with sodium hydroxide solution. Another option would be electrolytic etching with Barker. Barker is a color etchant, after etching with Barker an oxide layer forms on the surface and if the microscope is equipped with a Lambda plate, then different grains can be seen with different colors under the optical microscope (figure 13-15).

QATM- Preparation method

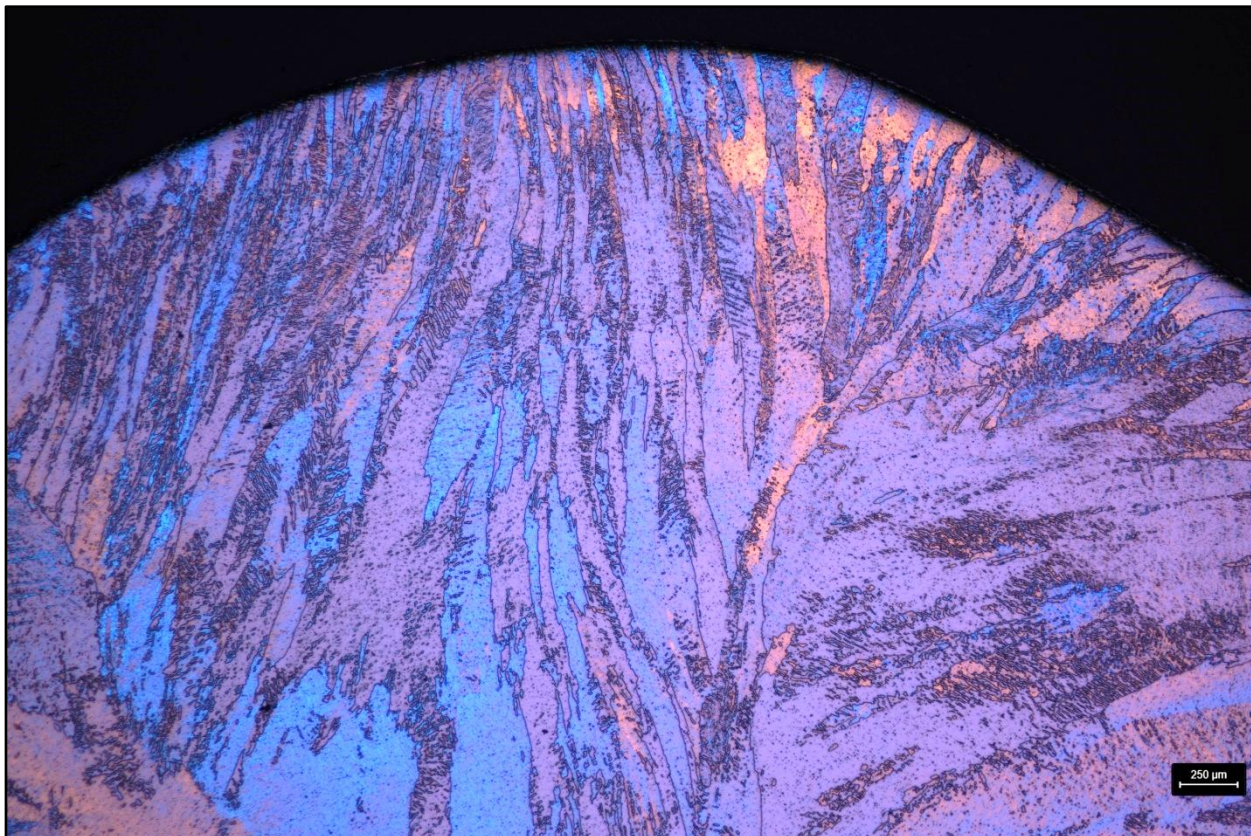


Figure 13. The cross section of sample 2 after electrolytic etching with barker – 25:1.

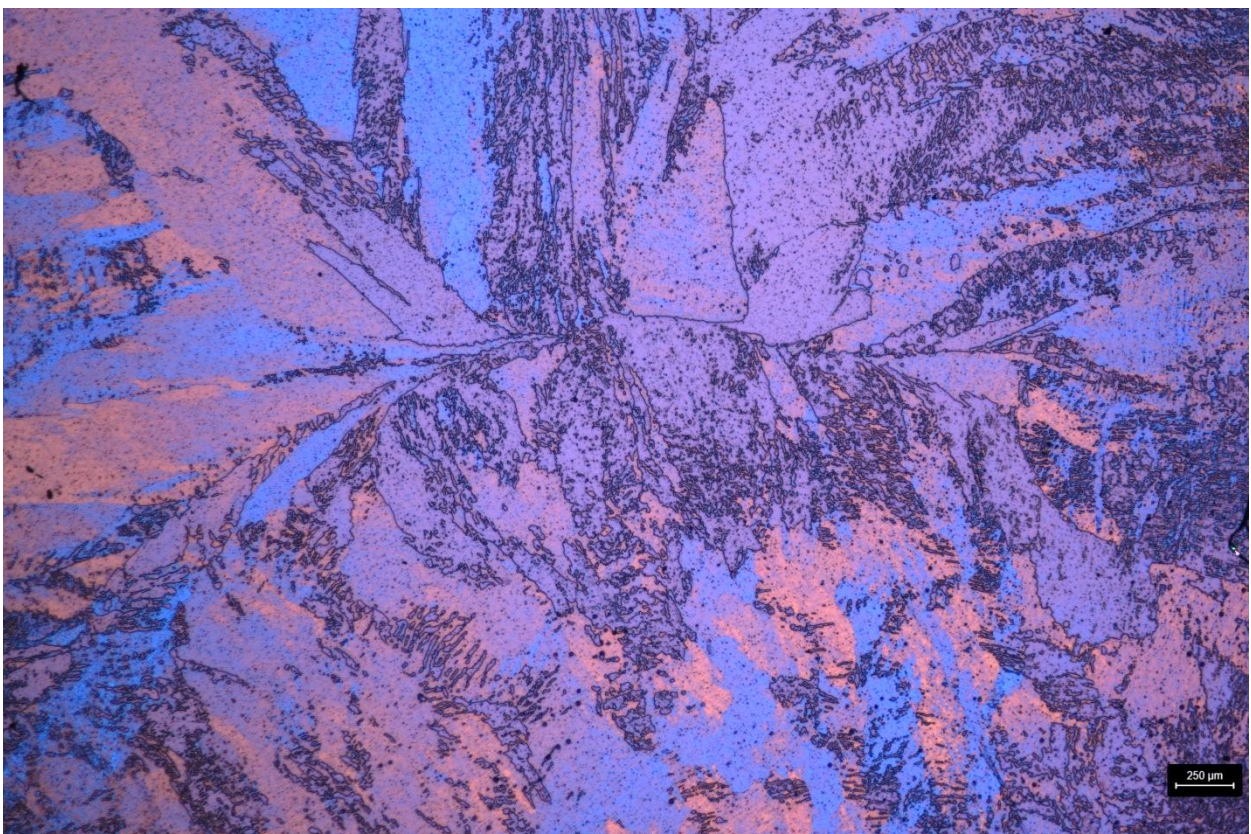


Figure 14. The cross section of sample 2 after electrolytic etching with barker – 25:1.