
Prior Austenite Grain boundaries etching reagent »PAG QT²« und »PAG HT«

For quenched and tempered (QT) and quenched (Q)
unalloyed and low-alloy steels

Ätzmittel auf ehemalige Austenitkorngrenzen
Für vergütete (QT) und gehärtete (Q)
un- und niedriglegierte Stähle

Herzogenrath, den 08.07.2025

Robert Füllmann

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- 2 Etching with PAG QT²**
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- 4 Etching Technique**

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Prior austenite grain boundaries etching reagent

PAG QT² and PAG HT made by Schmitz

Material	Etching reagent	Material	Etching reagent
16MnCr5 1.7131 case-hardened	PAG QT² Best choice for materials with: - Low tempering temperatures - Cr-alloyed	23MnB3 1.5507 +Q	PAG HT Best choice for materials with: - No Cr and/or - Tempered at high temperatures
G17CrMo-9-10 1.7379 +SR		23MnB3 1.5507 +QT 8.8	
32CrB4 1.7076 +Q		23MnB3 1.5507 +QT 10.9	
34CrMo4 1.7220 +Q		23MnB3 1.5507 +QT 11.9	
35B2 1.5511 +QT		32CrB4 1.7076 +QT 12.9	
36CrB4 1.7077 +Q		34CrMo4 1.7720 +QT 12.9	
36CrB4 1.7077 +QT 8.8		35B2 1.5511 +QT 9.8	
36CrB4 1.7077 +QT 10.9		C45E 1.1191 +QW +T	
36CrB4 1.7077 +QT 12.9		C60E 1.1221 +QW +T	
42CrMo4 1.7227 induction-hardened		C85S 1.1269 +QW +T	
51CrV4 1.8159 +QO +T		C100S 1.1274 +QW +T	
102Cr6 1.2067 +QT			

Contents

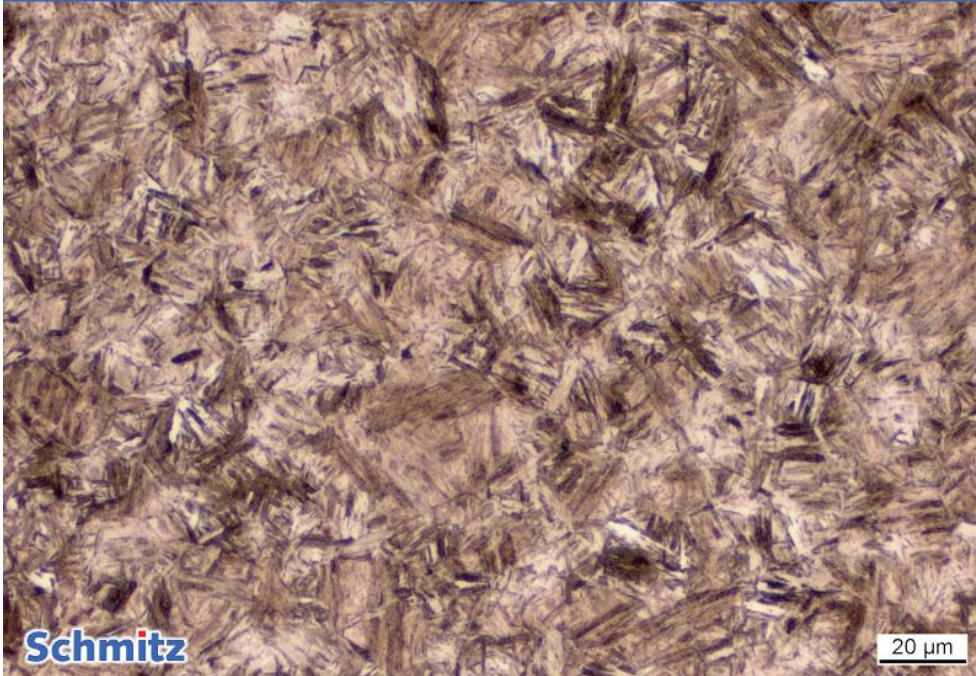
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32CrB4 | 1.7076 +Q

Etched with Nital and PAG QT²

1.7076 | 32CrB4 +Q (12.9) 491 HV 1

3 % Nital

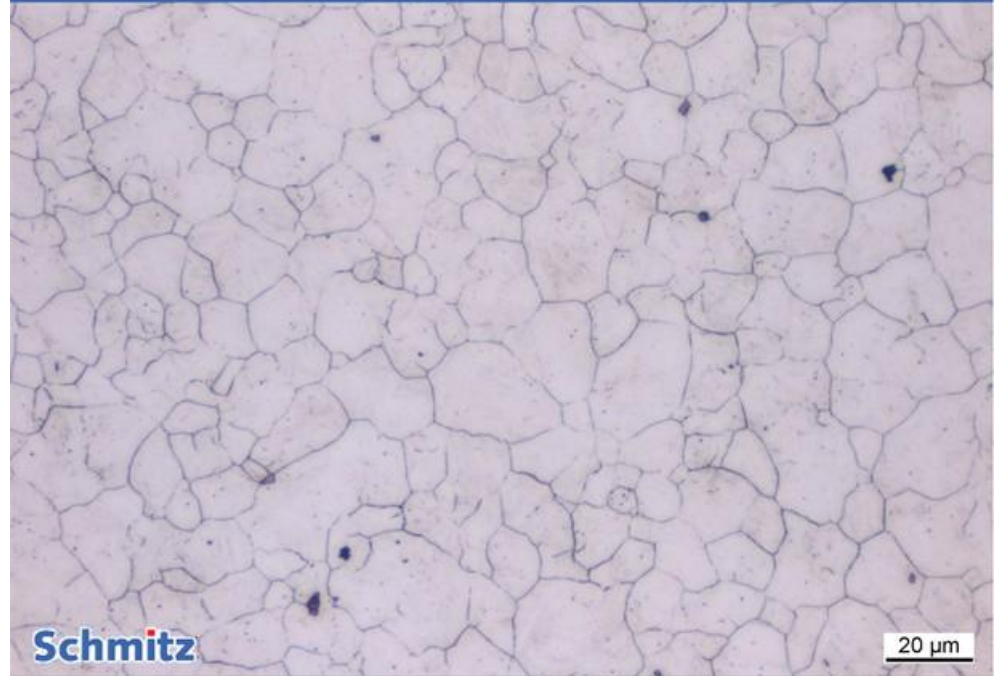


■ Time: 15 s

■ Temperature: 22 °C | 72 °F

1.7076 | 32CrB4 +Q (12.9) 491 HV 1

PAG QT²



■ Time: 3+3+15 min

■ Temperature: 22 °C | 72 °F

Quelle:

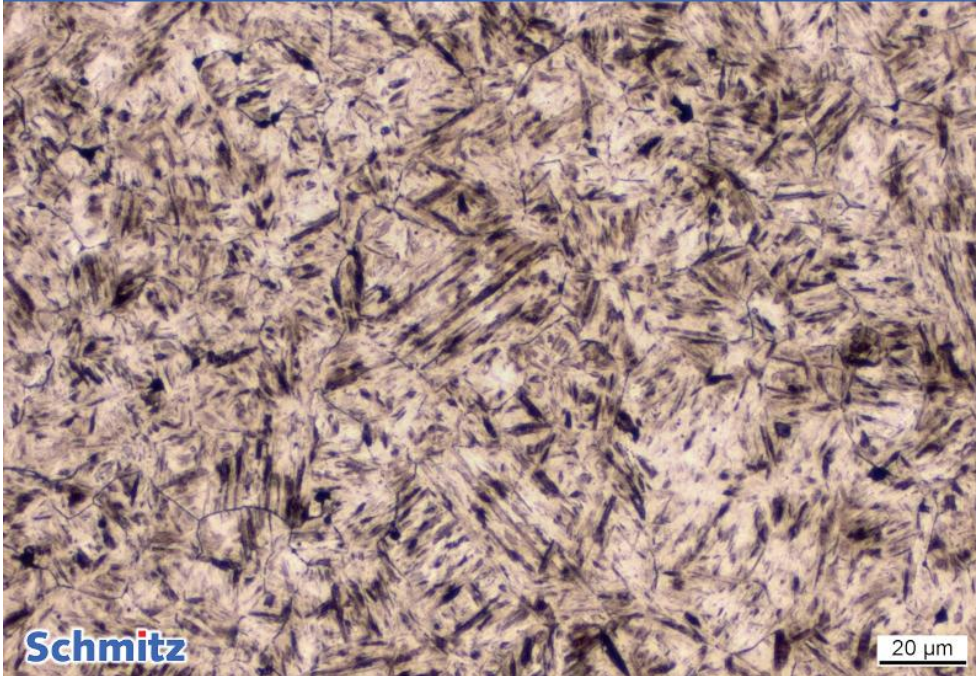
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34CrMo4 | 1.7220 +Q

Etched with Nital and PAG QT²

1.7220 | 34CrMo4 +Q 557 HV 1

3 % Nital

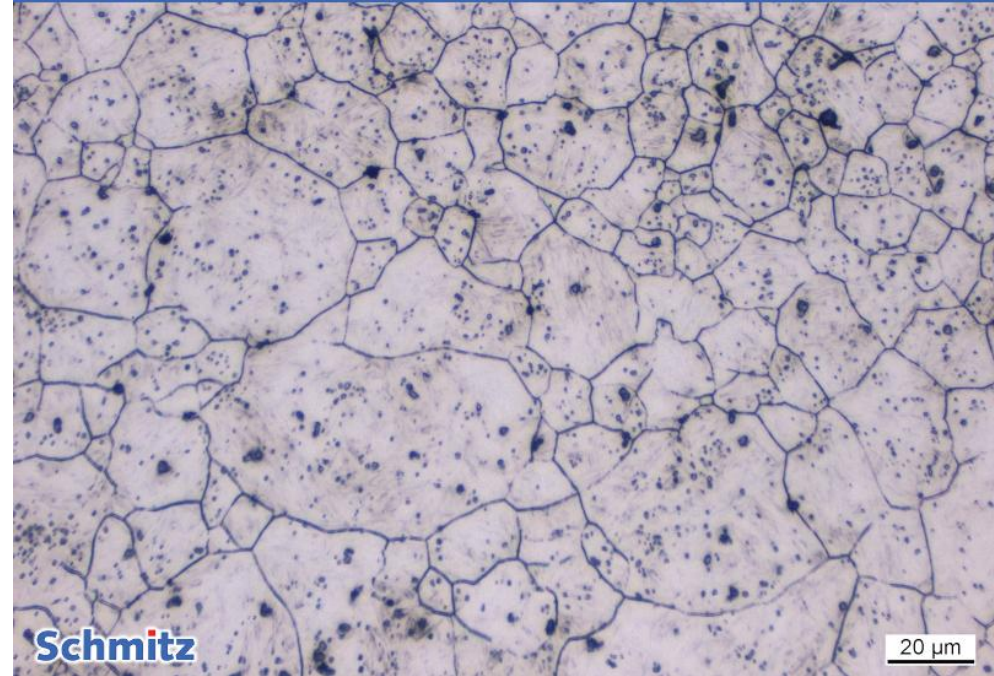


■ Time: 15 s

■ Temperature: 22 °C | 72 °F

1.7220 | 34CrMo4 +Q 557 HV 1

PAG QT²



■ Time: 3+3+15 min

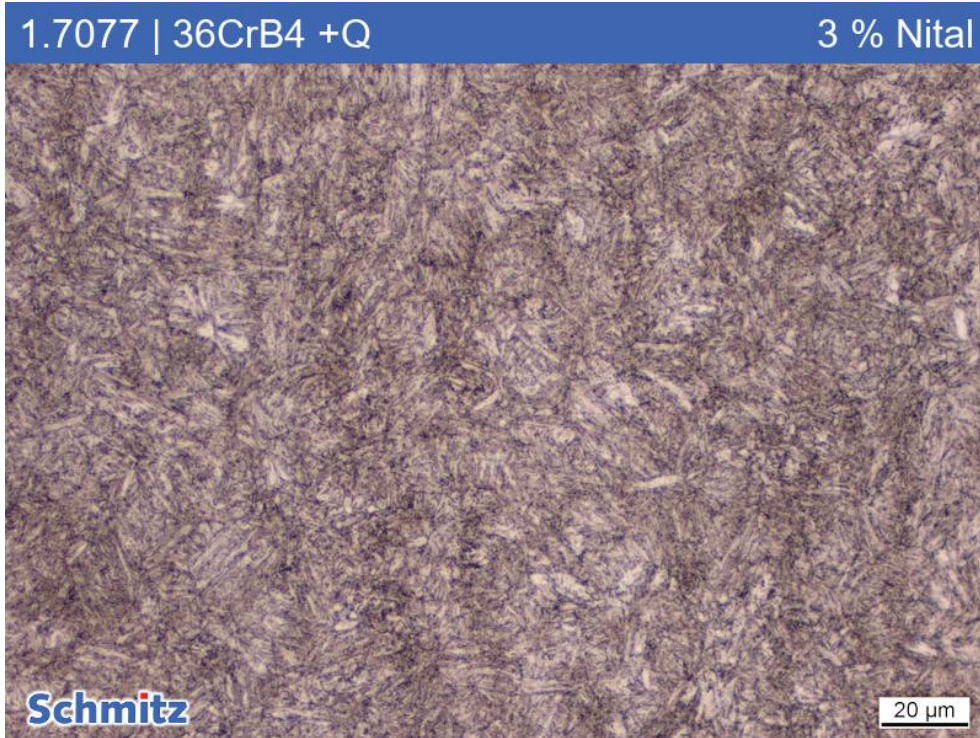
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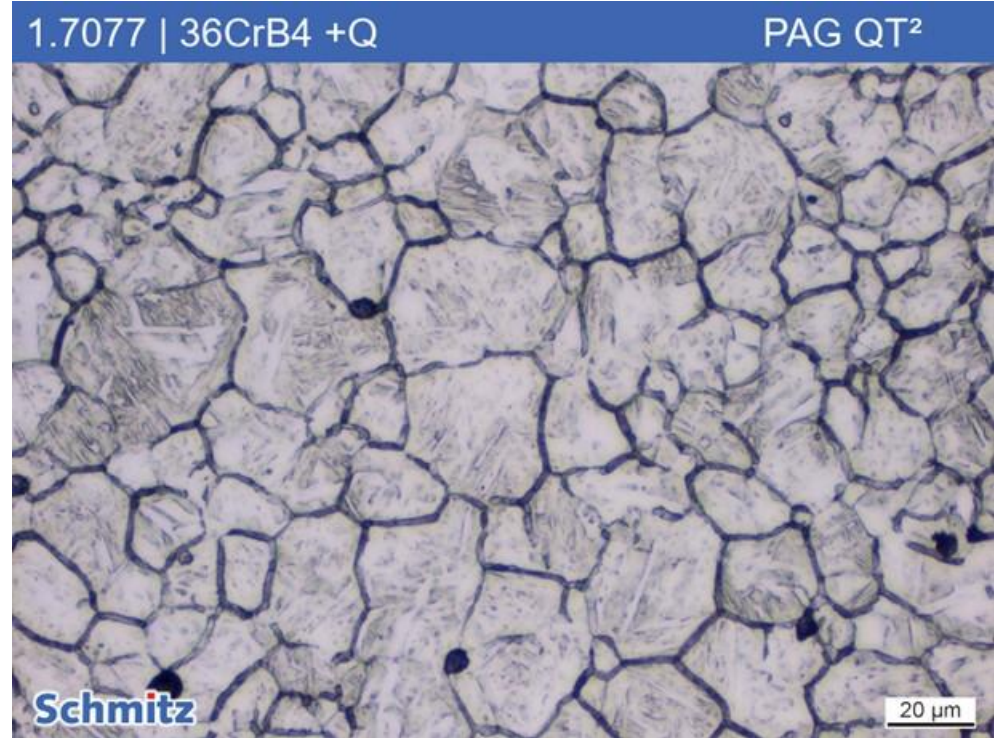
36CrB4 | 1.7077 +Q

Etched with Nital and PAG QT²



■ Time: 8 s

■ Temperature: 22 °C | 72 °F



■ Time: 3+3+15+180 min + 30 s OPS

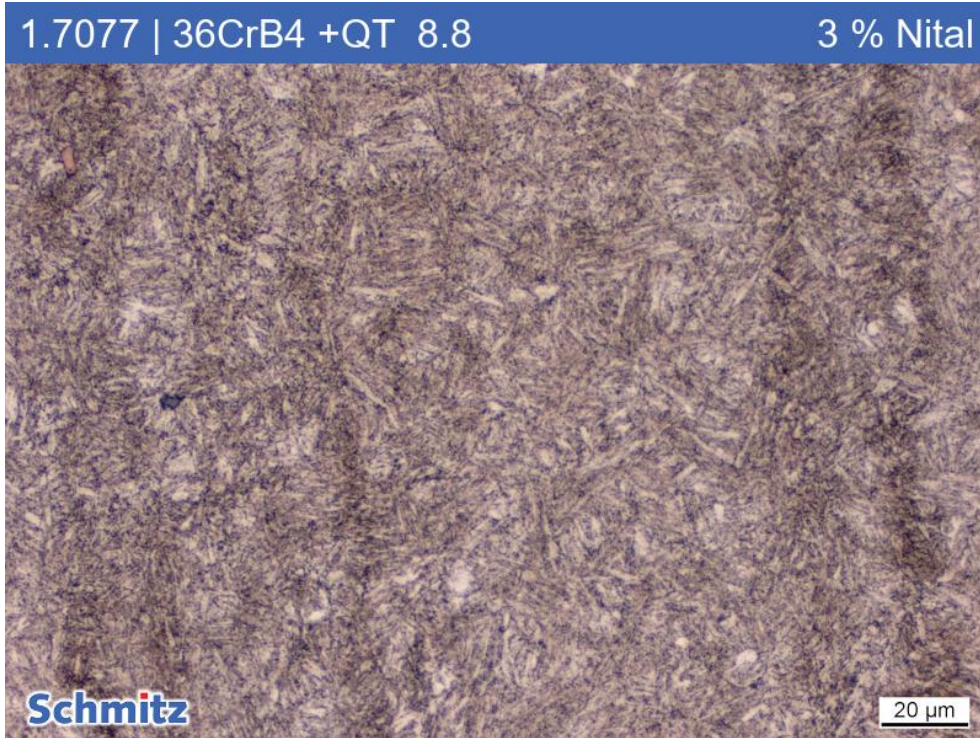
■ Temperature: 22 °C | 72 °F

Quelle:

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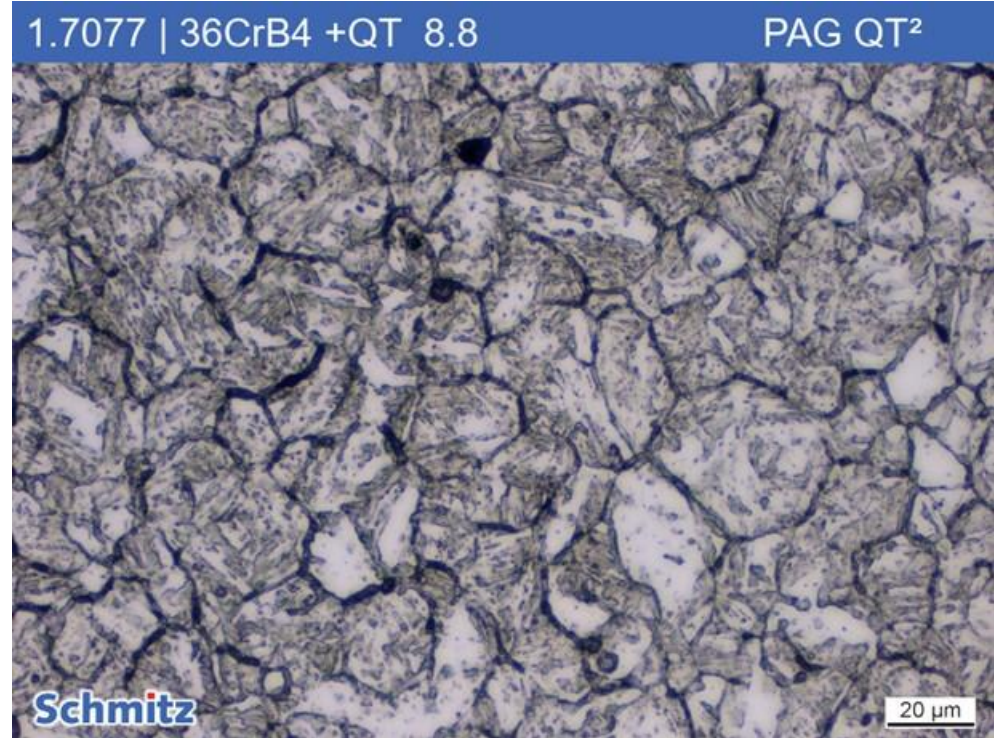
36CrB4 | 1.7077 +QT 8.8

Etched with Nital and PAG QT²



■ Time: 8 s

■ Temperature: 22 °C | 72 °F



■ Time: 3+3+15+180 min + 30 s OPS

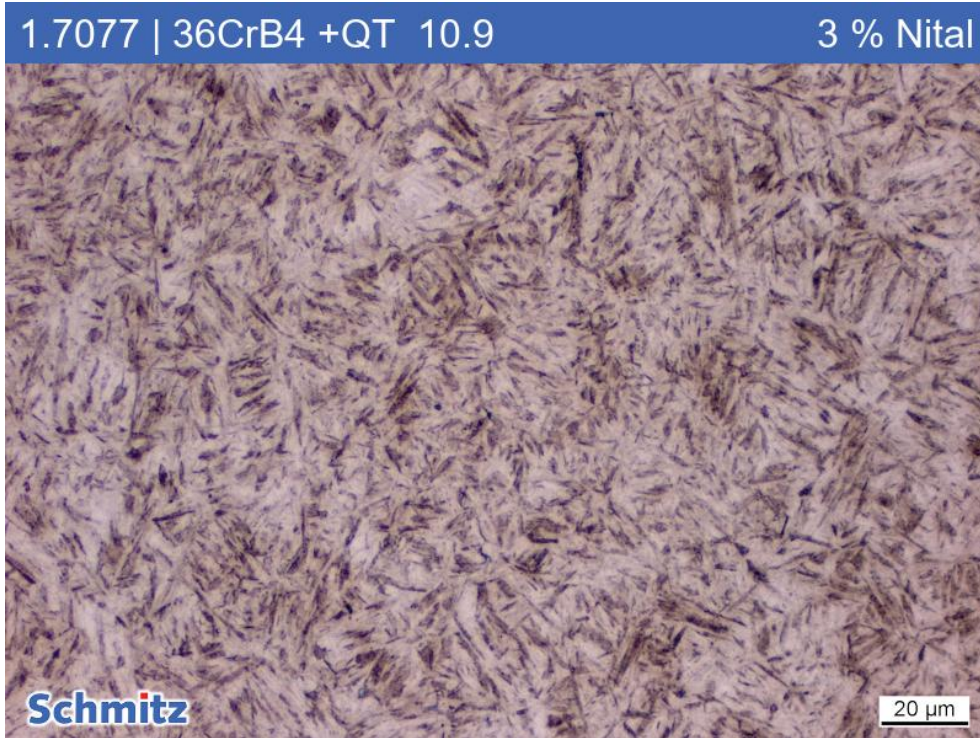
■ Temperature: 22 °C | 72 °F

Quelle:

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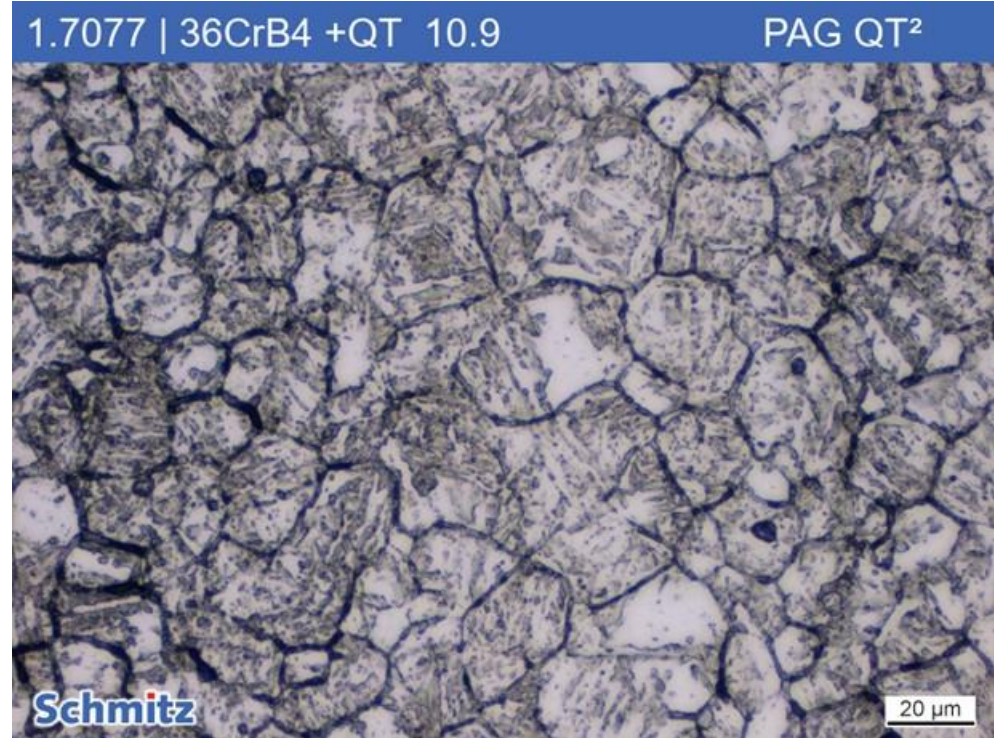
36CrB4 | 1.7077 +QT 10.9

Etched with Nital and PAG QT²



■ Time: 8 s

■ Temperature: 22 °C | 72 °F



■ Time: 3+3+15+180 min + 30 s OPS

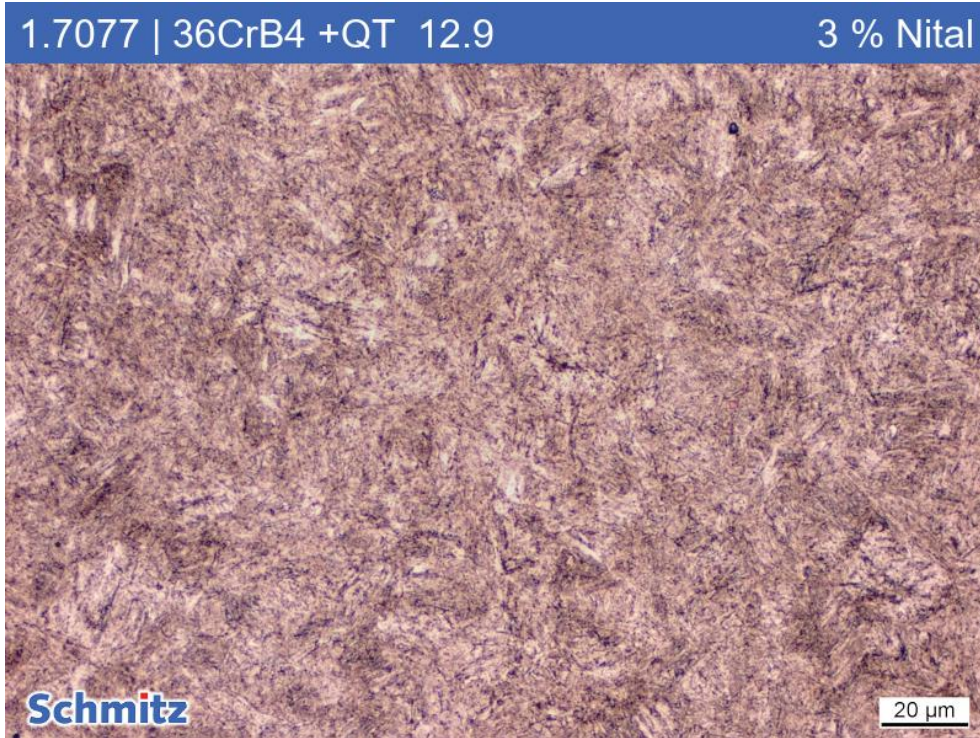
■ Temperature: 22 °C | 72 °F

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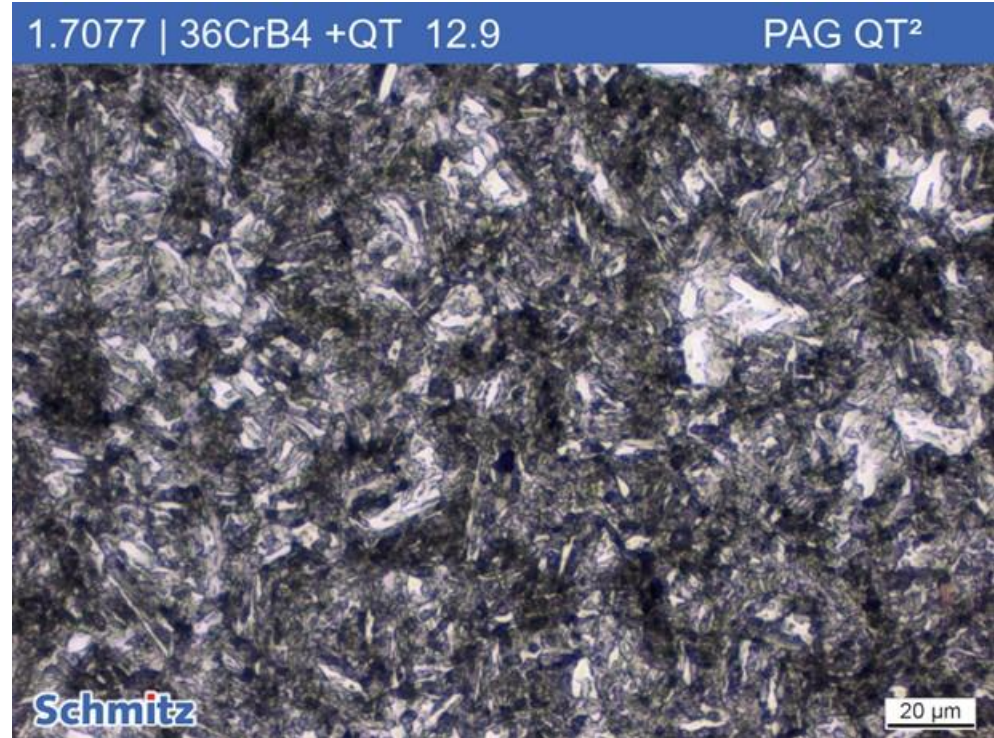
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36CrB4 | 1.7077 +QT 12.9

Etched with Nital and PAG QT²



- Time: 8 s
- Temperature: 22 °C | 72 °F



- Time: 3+3+15+180 min + 30 s OPS
- Temperature: 22 °C | 72 °F

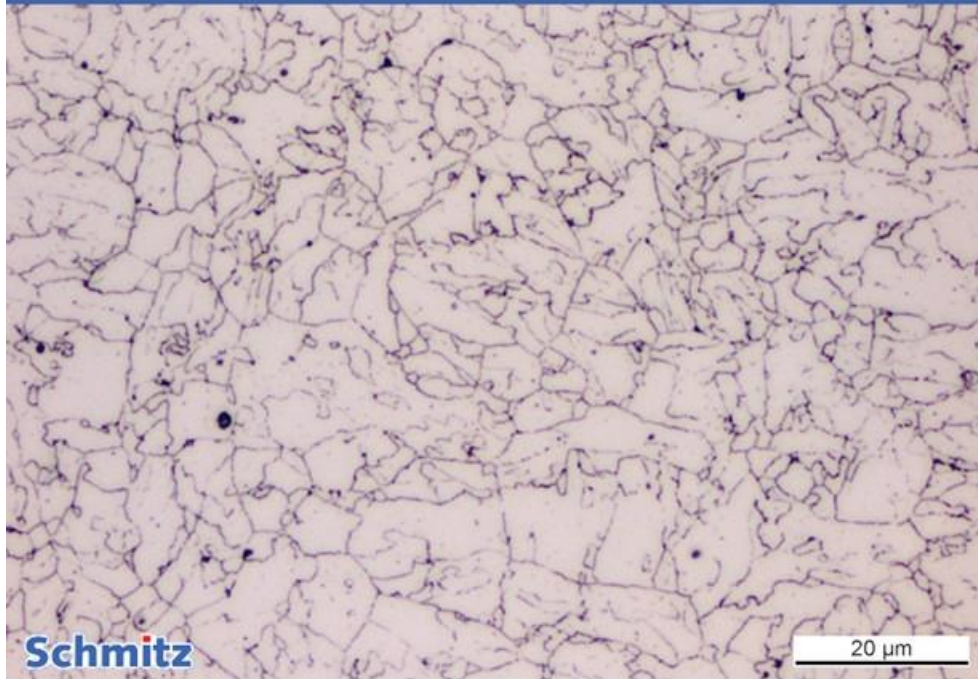
Quelle:

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G17CrMo-9-19 | 1-7389 + SR and 35B2 | 1.5511 +QT

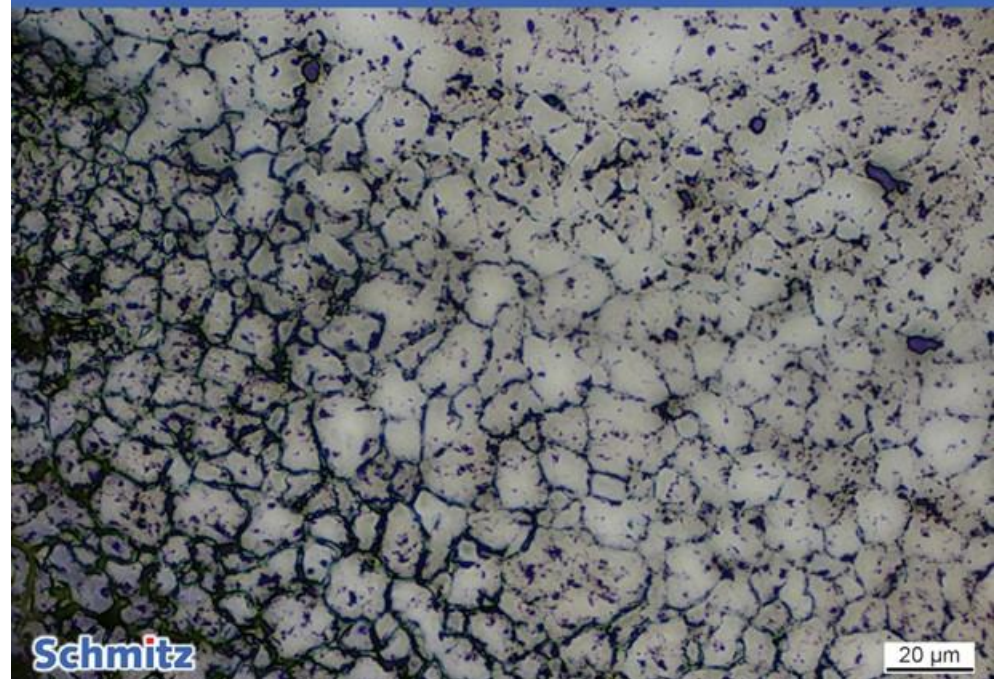
Etched with PAG QT²

1.7379 | G17CrMo-9-10 +SR



- Time: 3+3 min + 2 min OPS
- Temperature: 22 °C | 72 °F

1.5511 35B2 +QT

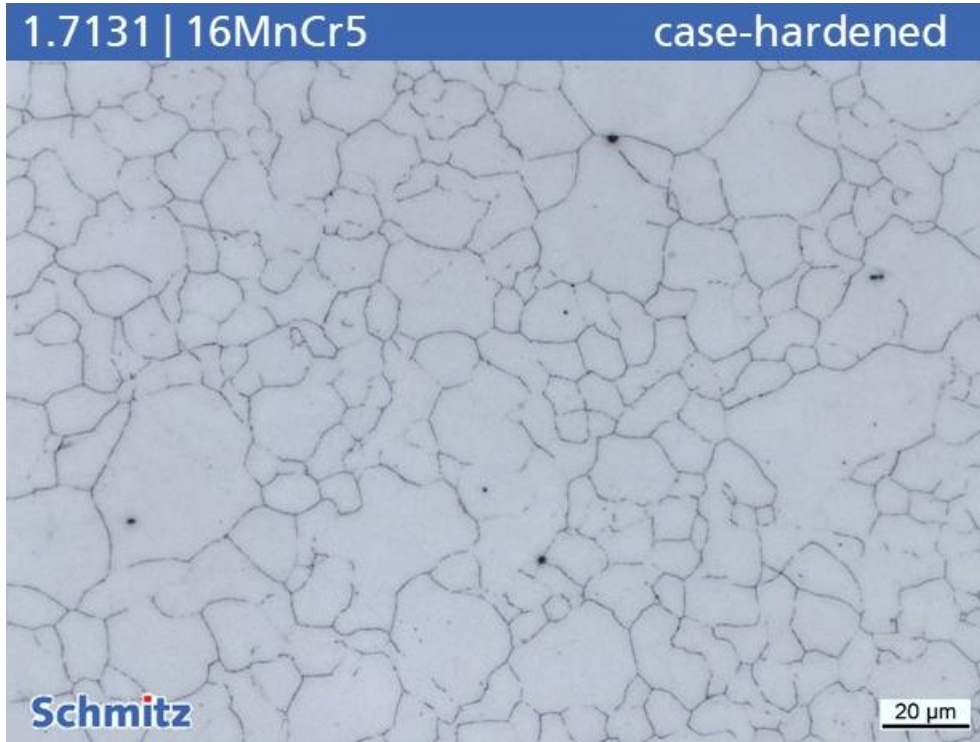


- Time: 3+3+15 min
- Temperature: 22 °C | 72 °F

Quelle:

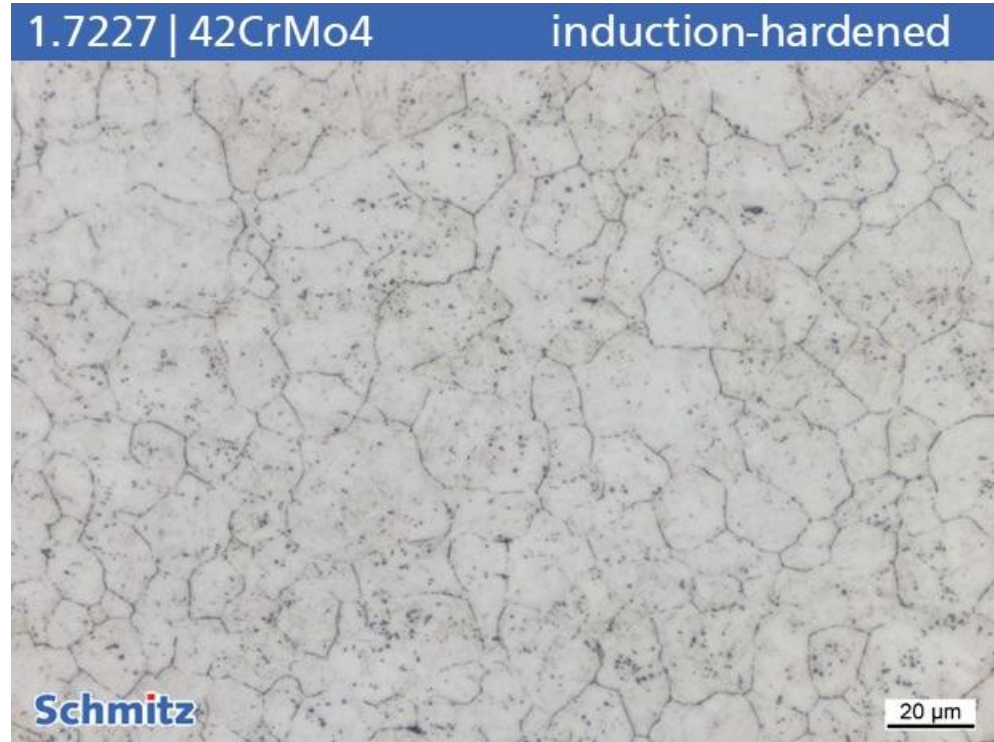
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16MnCr5 | 1.7131 case-hardened and 42CrMo4 | 1.7227 induction-hardened etched with PAG QT²



■ Time: 2x 2 min

■ Temperature: 22 °C | 72 °F



■ Time: 16 min

■ Temperature: 22 °C | 72 °F

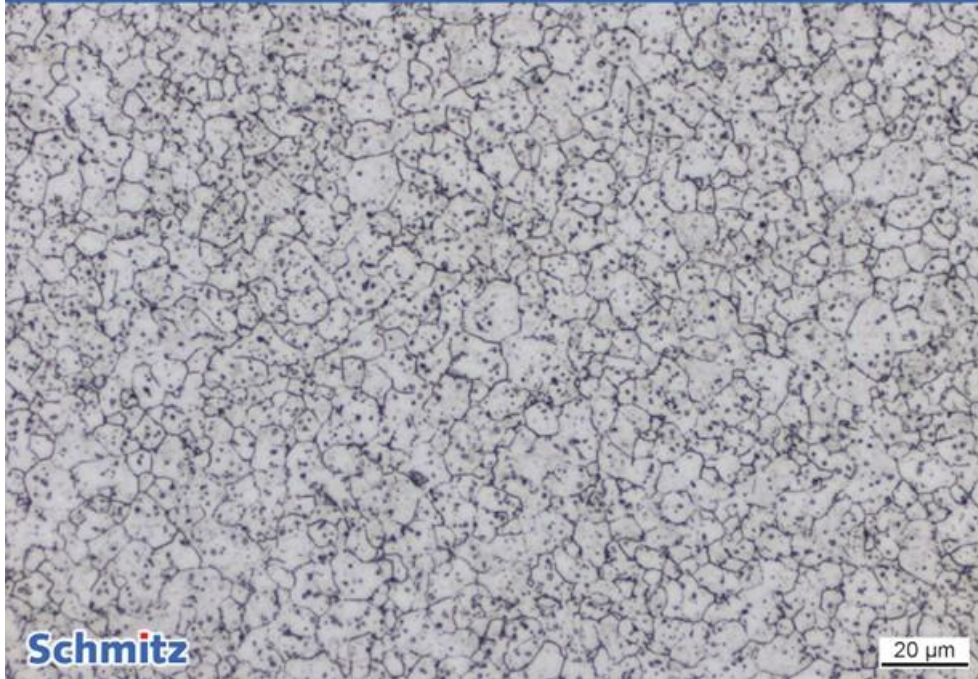
Quelle:

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51CrV4 | 1.8159 +QO +T and 102Cr6 | 1.2067 + QT

Etched with PAG QT²

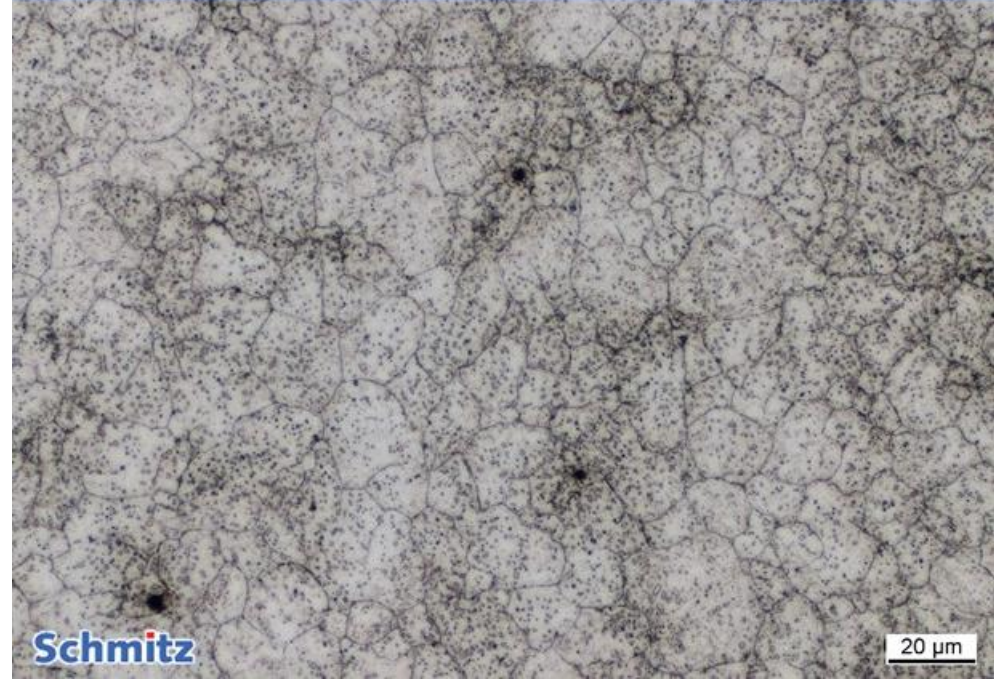
1.8159 | 51CrV4 +QO +T



■ Time: 2x 5 min

■ Temperature: 22 °C | 72 °F

1.2067 | 102Cr6 +QT



■ Time: 3x 2 min

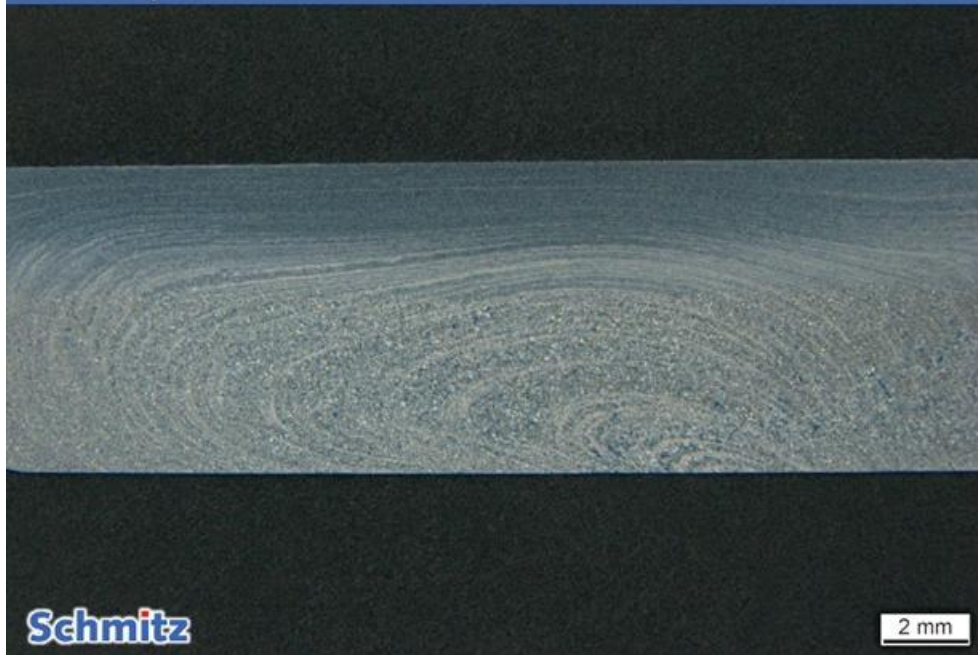
■ Temperature: 22 °C | 72 °F

Quelle:

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Fibre flows made visible with PAG QT² C45 | 1.0503 and rivet connection

1.0503 | C45 Induction-hardened Fibre flow



- Time: 3x 3 min
- Temperature: 22 °C | 72 °F

Nietverbindung Fibre flow

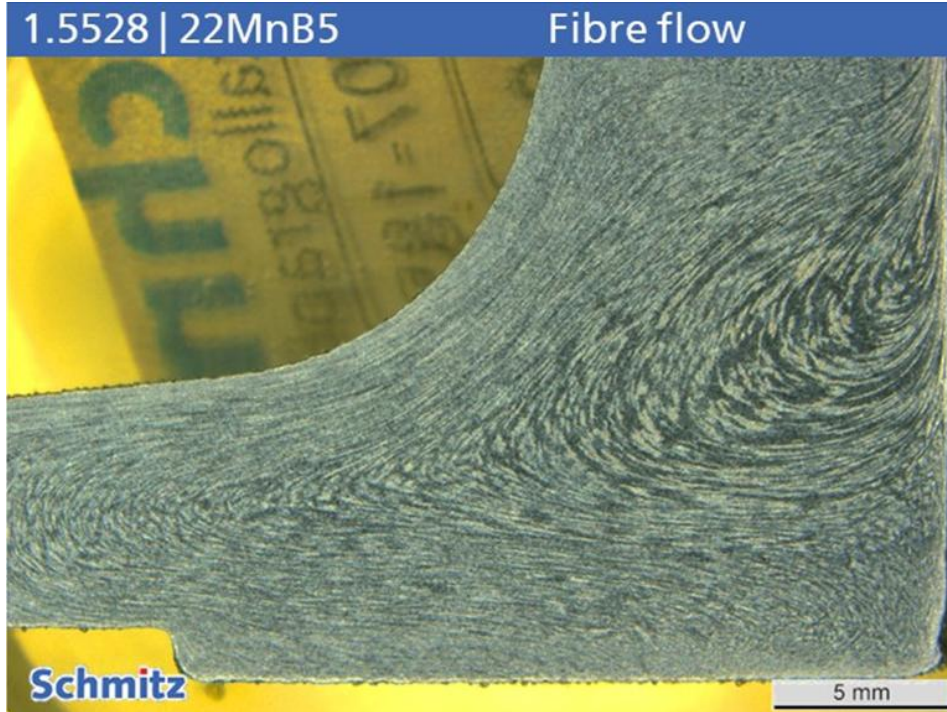


- Time: 3 min
- Temperature: 22 °C | 72 °F

Quelle:

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Fibre flows made visible with PAG QT² 22MnB5 | 1.5528 forged



- Time: 1x 5 min
- Temperature: 22 °C | 72 °F

Quelle:

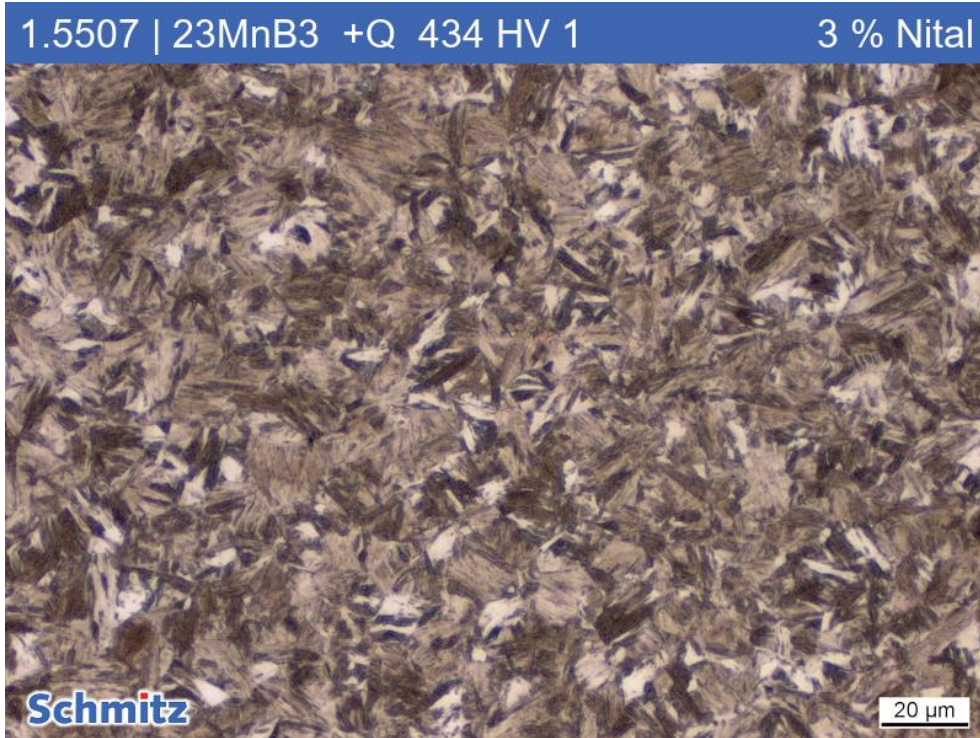
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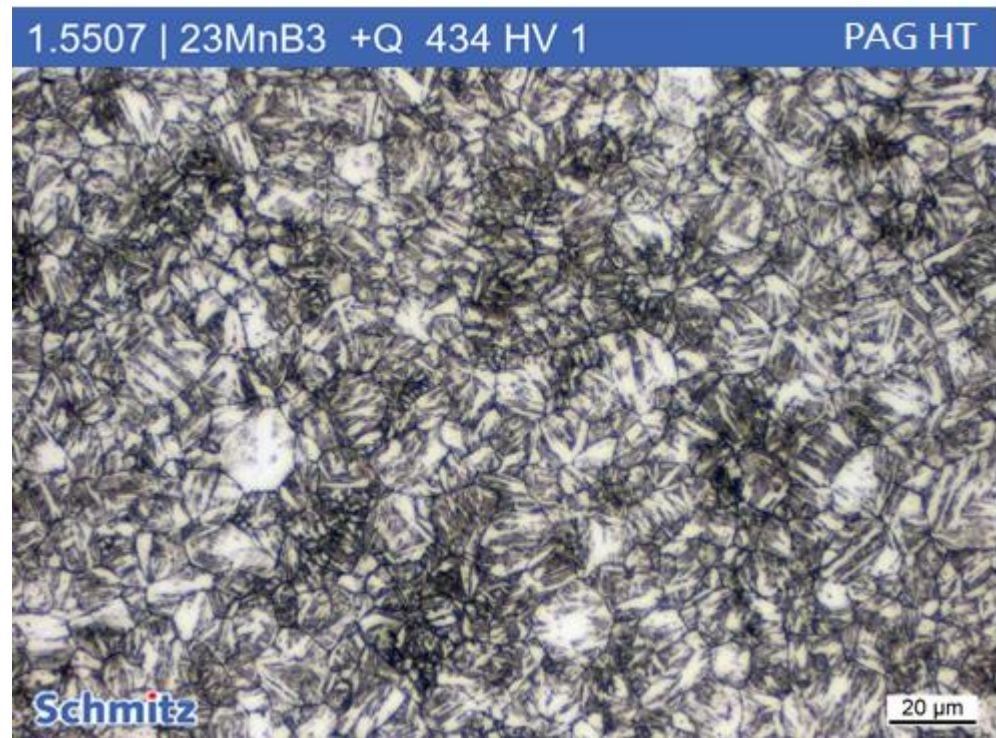
23MnB3 | 1.5507 +Q

Etched with Nital and PAG HT



■ Time: 15 s

■ Temperature: 22 °C | 72 °F



■ Time: 3 min

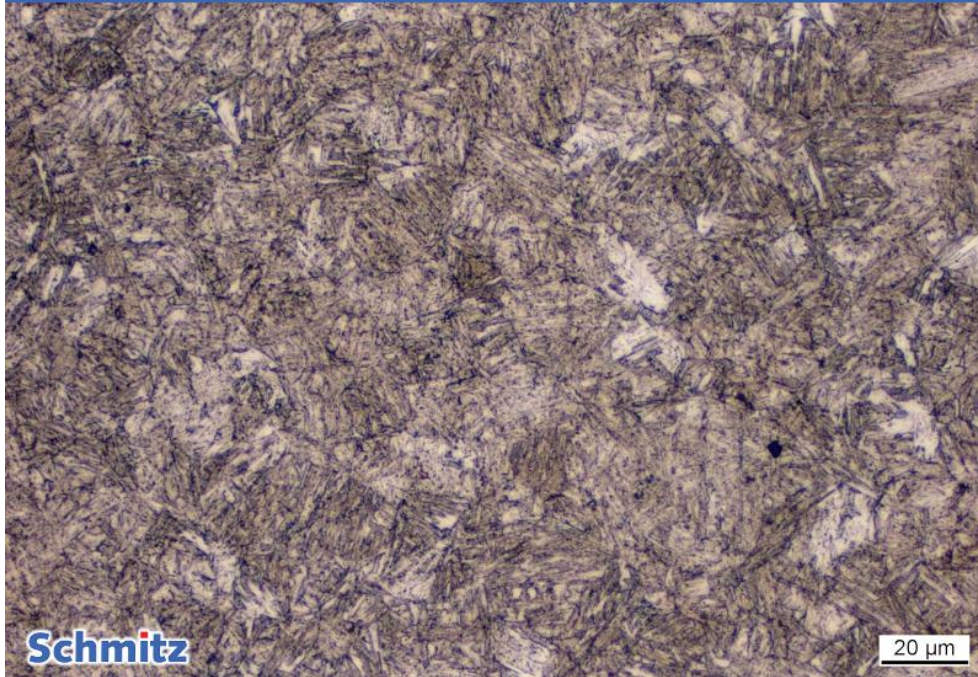
■ Temperature: 22 °C | 72 °F

Quelle:

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23MnB3 | 1.5507 +QT 8.8 Etched with Nital and PAG HT

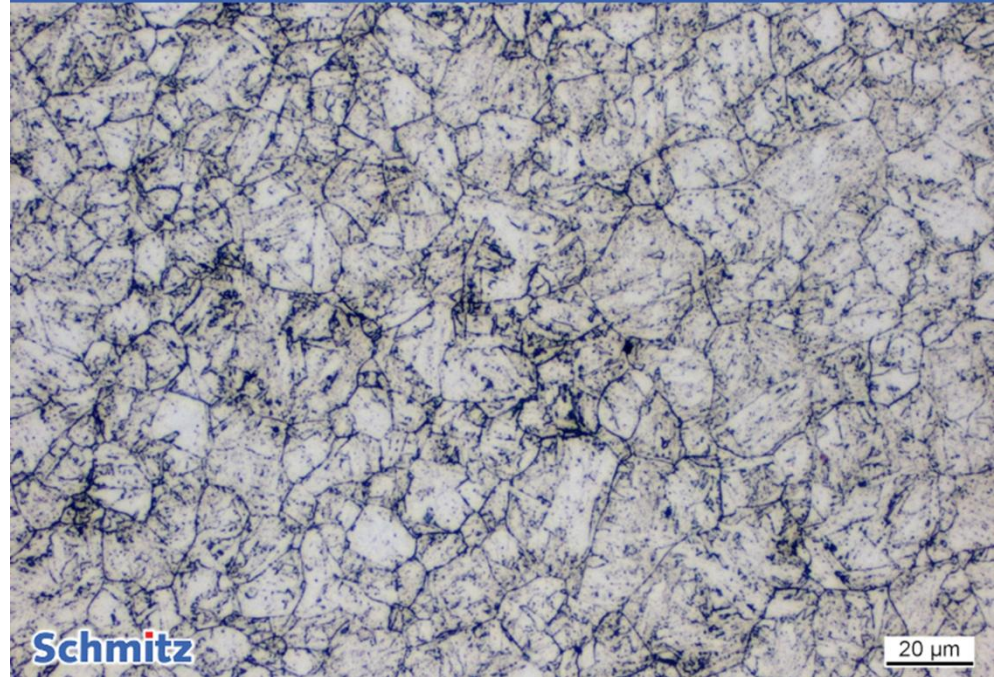
1.5507 | 23MnB3 +QT (8.8) 283 HV 1 3 % Nital



■ Time: 15 s

■ Temperature: 22 °C | 72 °F

1.5507 | 23MnB3 +QT (8.8) 283 HV 1 PAG HT



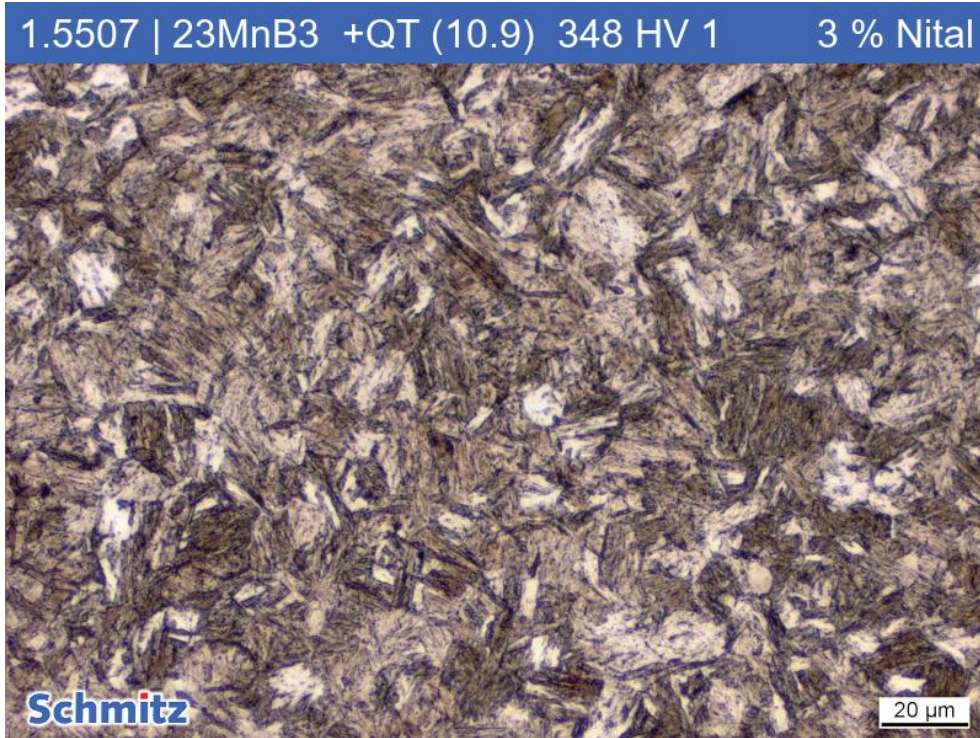
■ Time: 3 min

■ Temperature: 22 °C | 72 °F

Quelle:

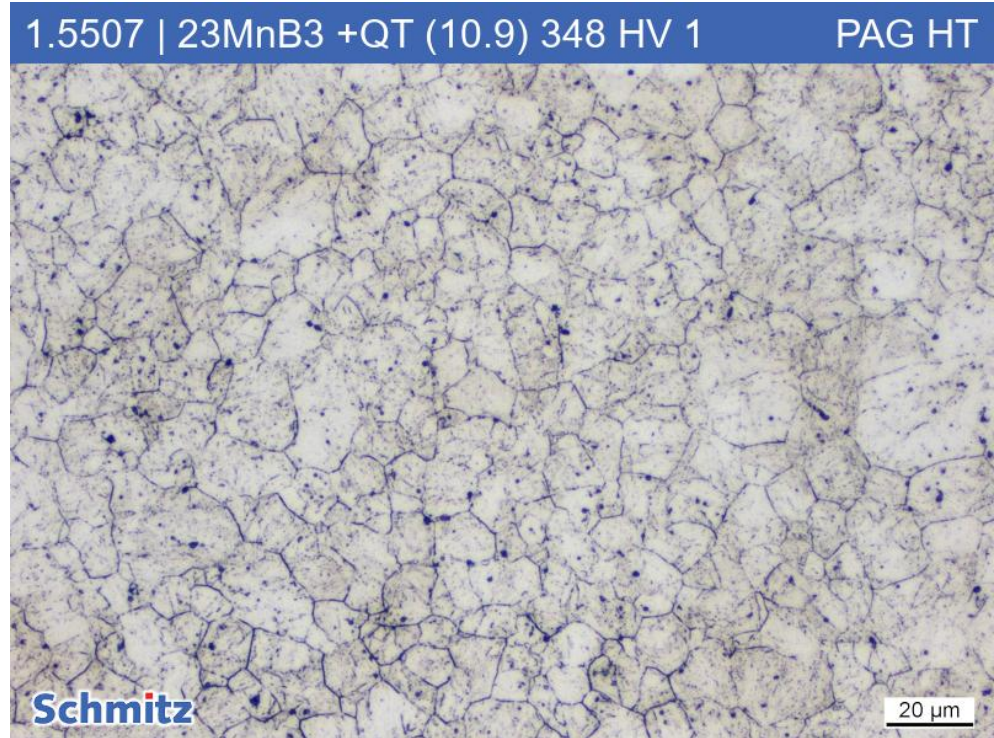
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23MnB3 | 1.5507 +QT 10.9 Etched with Nital and PAG HT



■ Time: 15 s

■ Temperature: 22 °C | 72 °F



■ Time: 3 min

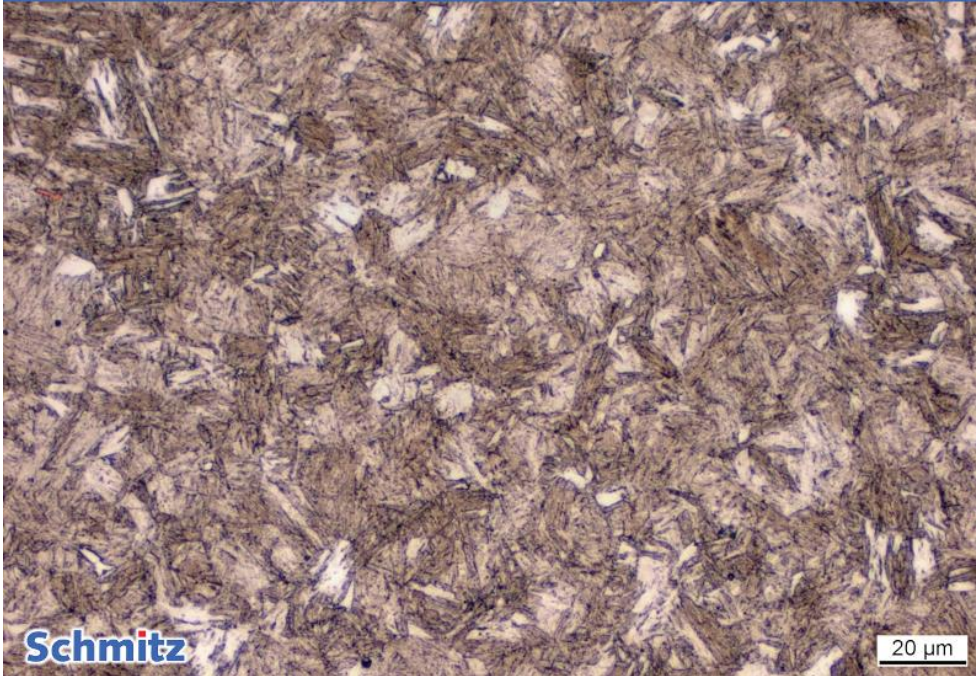
■ Temperature: 22 °C | 72 °F

Quelle:

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23MnB3 | 1.5507 +QT 11.9 Etched with Nital and PAG HT

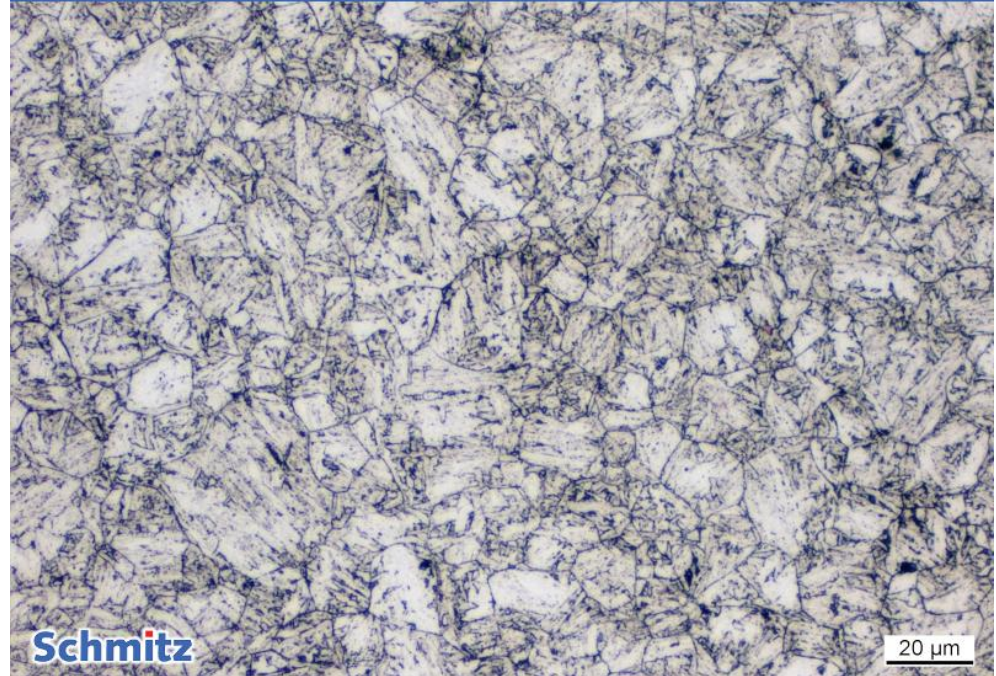
1.5507 | 23MnB3 +QT (11.9) 374 HV 1 3 % Nital



■ Time: 15 s

■ Temperature: 22 °C | 72 °F

1.5507 | 23MnB3 +QT (11.9) 374 HV 1 PAG HT



■ Time: 3 min

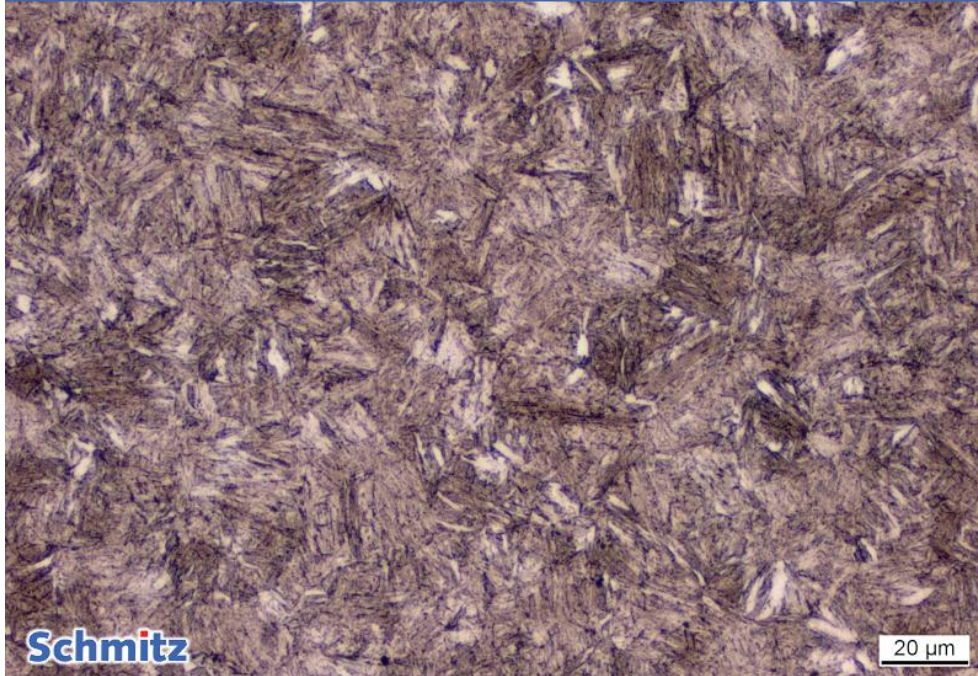
■ Temperature: 22 °C | 72 °F

Quelle:

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32CrB4 | 1.7076 +QT 12.9 Etched with Nital and PAG HT

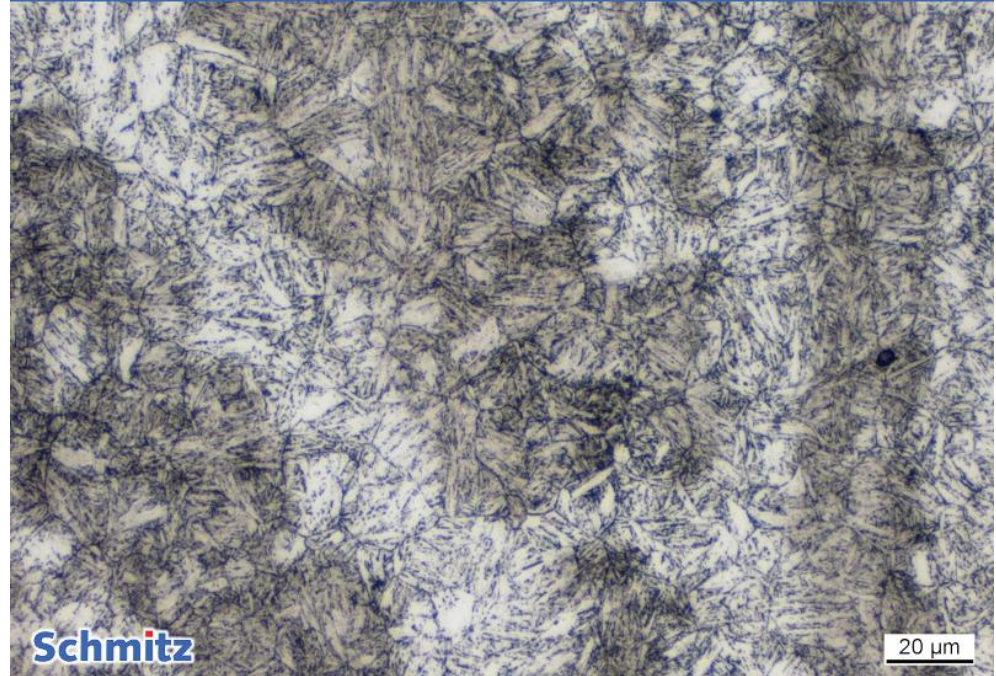
1.7076 | 32CrB4 +QT (12.9) 410 HV 1 3 % Nital



■ Time: 15 s

■ Temperature: 22 °C | 72 °F

1.7076 | 32CrB4 +QT (12.9) 410 HV 1 PAG HT



■ Time: 3 min

■ Temperature: 22 °C | 72 °F

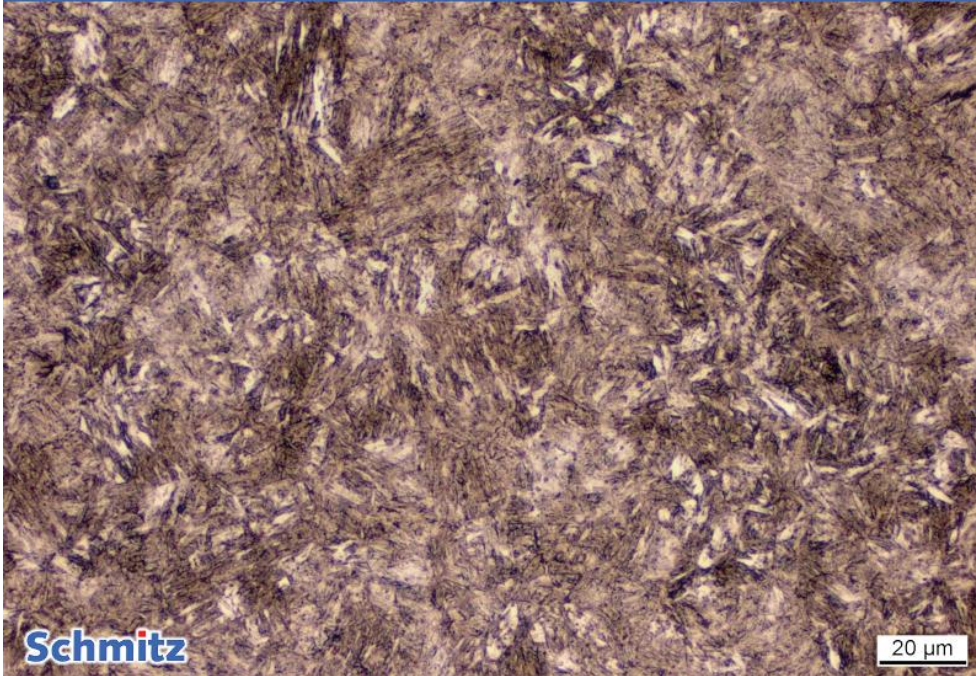
Quelle:

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34CrMo4 | 1.7720 +QT 12.9 Etched with Nital and PAG HT

1.7220 | 34CrMo4 +QT (12.9) 407 HV 1

3 % Nital

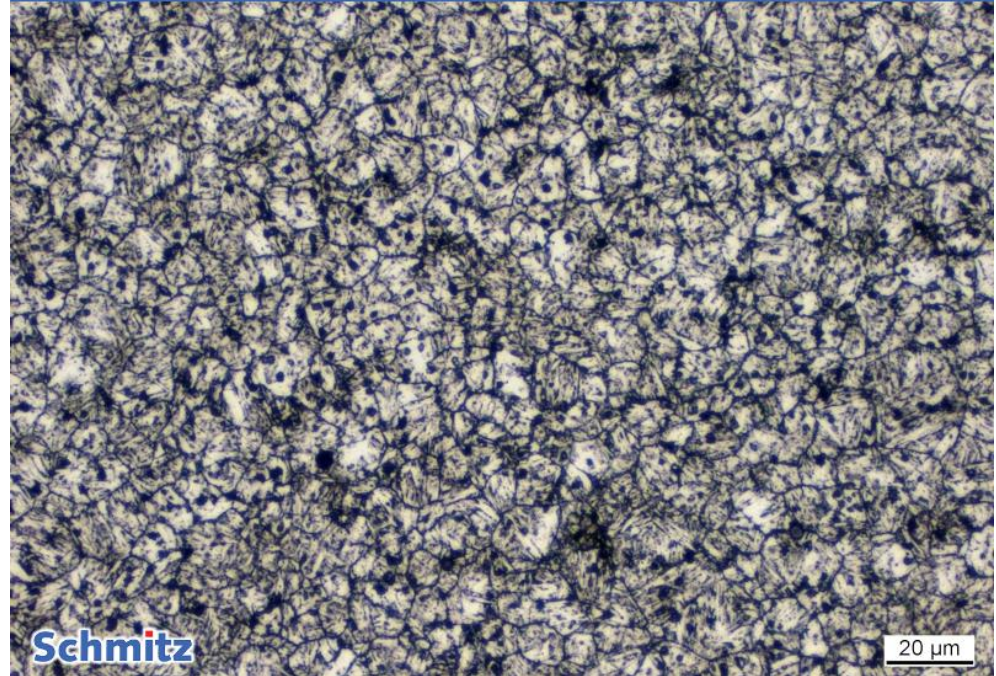


■ Time: 15 s

■ Temperature: 22 °C | 72 °F

1.7220 | 34CrMo4 +QT (12.9) 407 HV 1

PAG HT



■ Time: 3 min

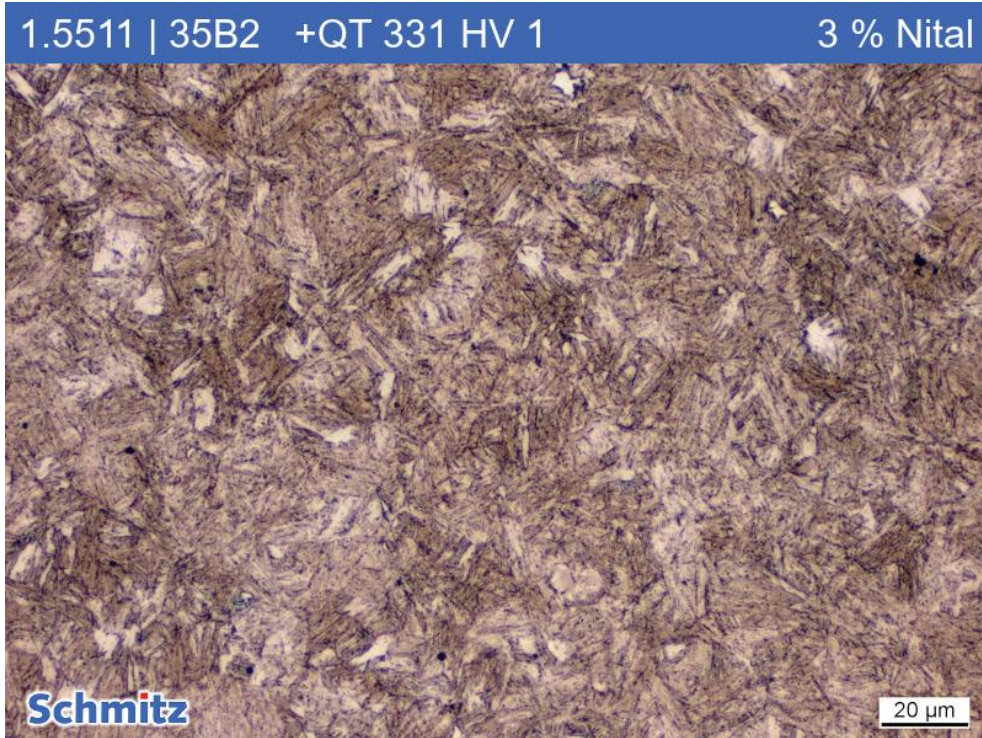
■ Temperature: 22 °C | 72 °F

Quelle:

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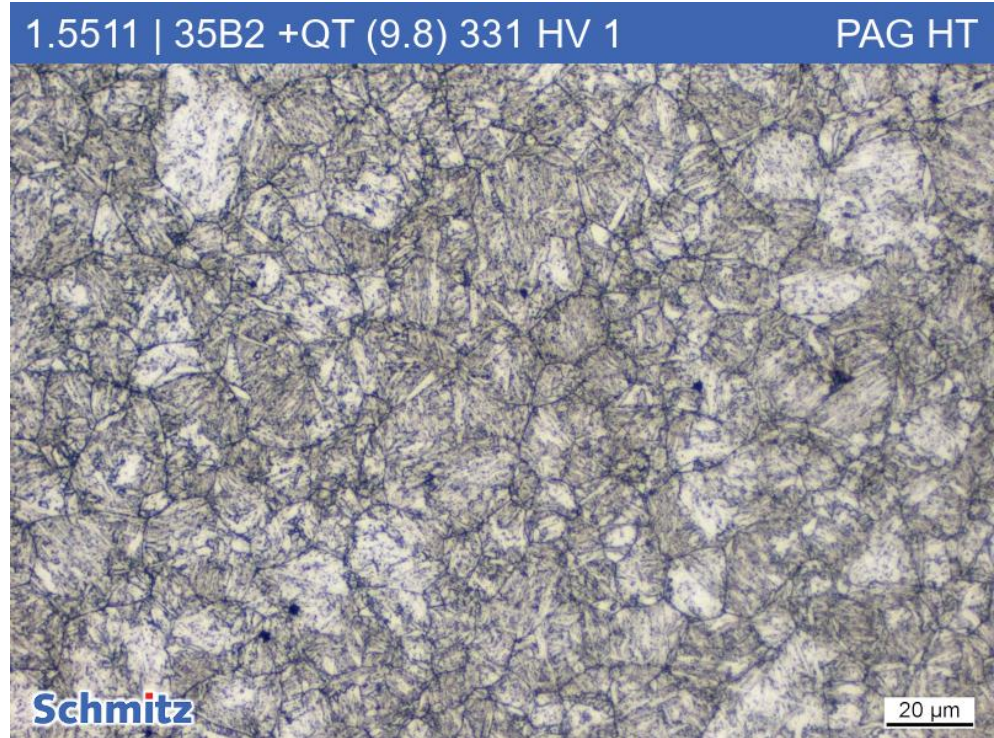
35B2 | 1.5511 +QT 9.8

Etched with Nital and PAG HT



■ Time: 15 s

■ Temperature: 22 °C | 72 °F



■ Time: 3 min

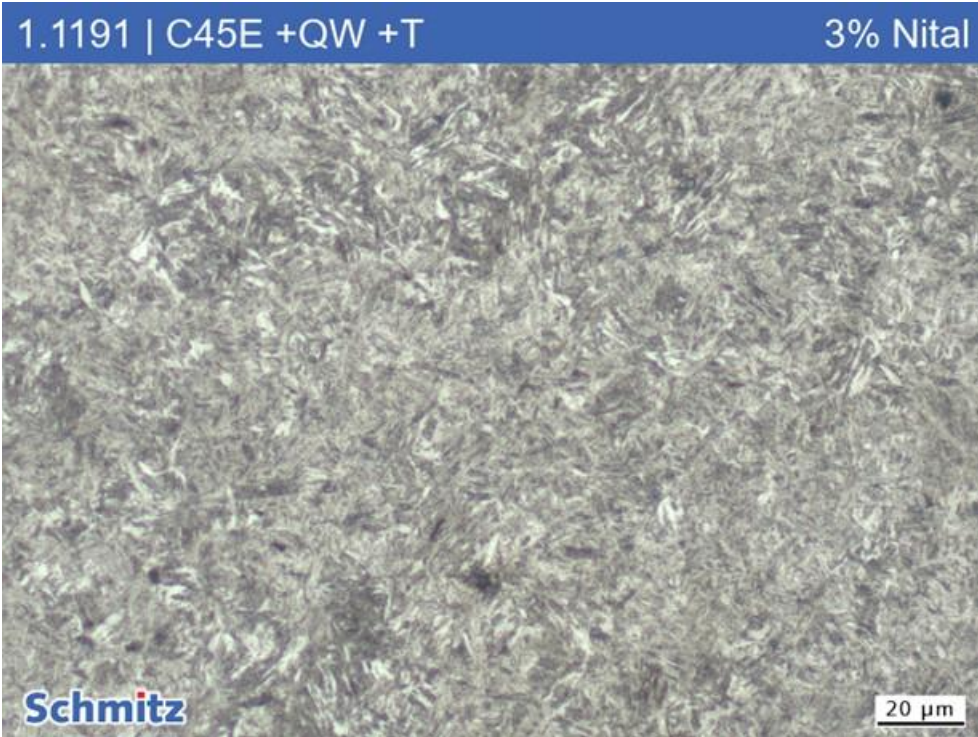
■ Temperature: 22 °C | 72 °F

Quelle:

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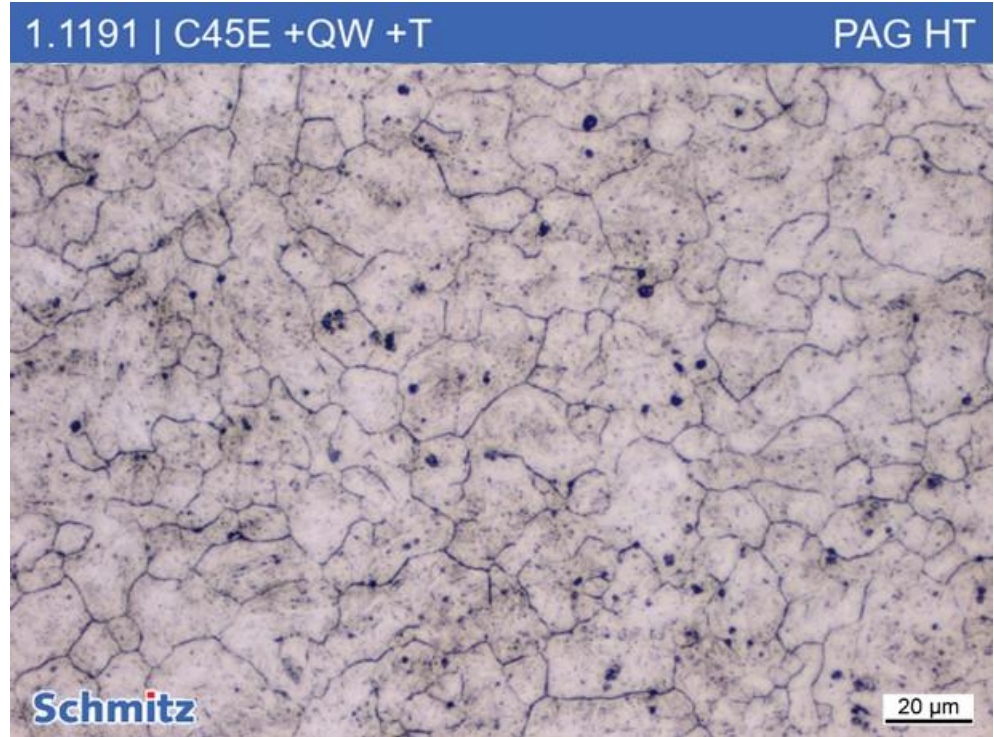
C45E | 1.1191 +QW +T

Etched with Nital and PAG HT



■ Time: 15 s

■ Temperature: 22 °C | 72 °F



■ Time: 3+3 min

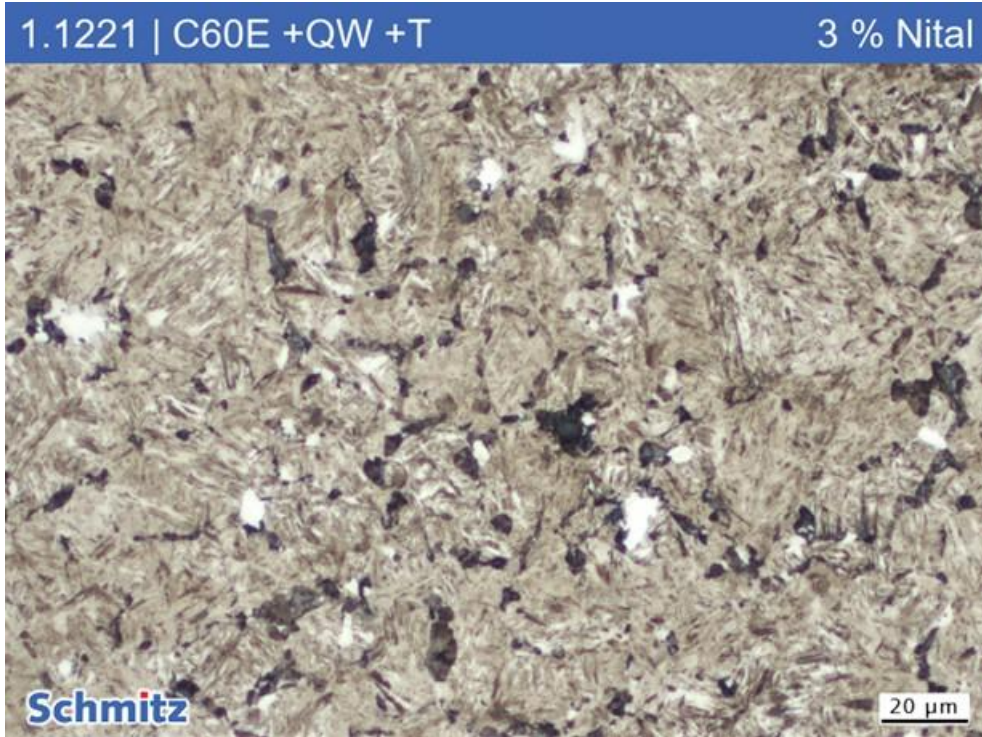
■ Temperature: 22 °C | 72 °F

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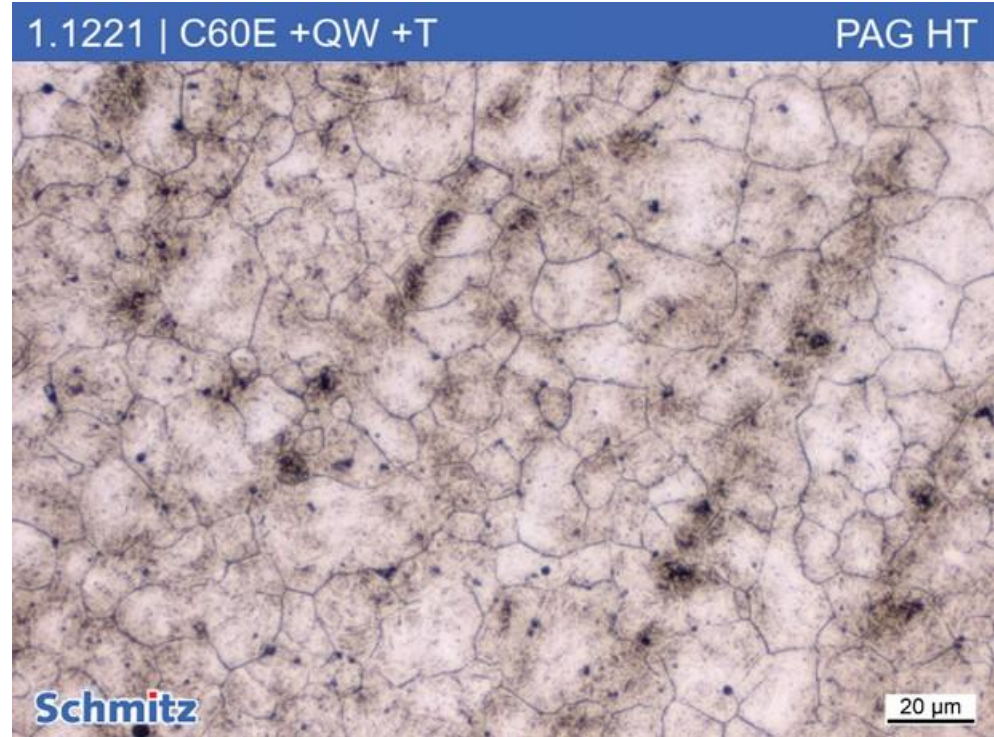
C60E | 1.1221 +QW +T

Etched with Nital and PAG HT



■ Time: 15 s

■ Temperature: 22 °C | 72 °F



■ Time: 3+3 min

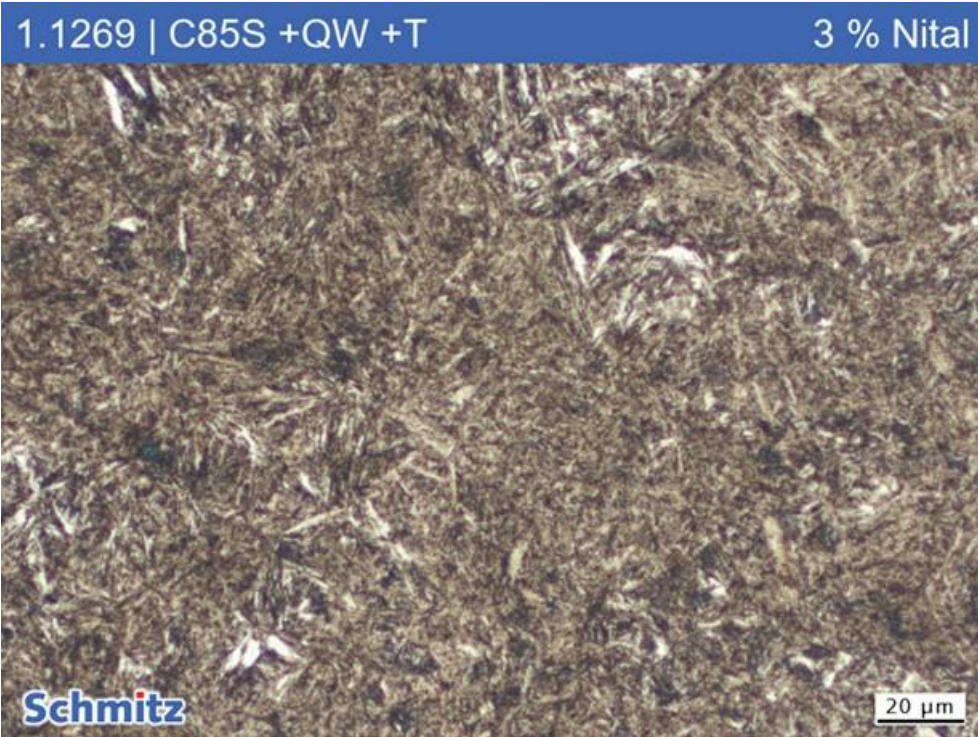
■ Temperature: 22 °C | 72 °F

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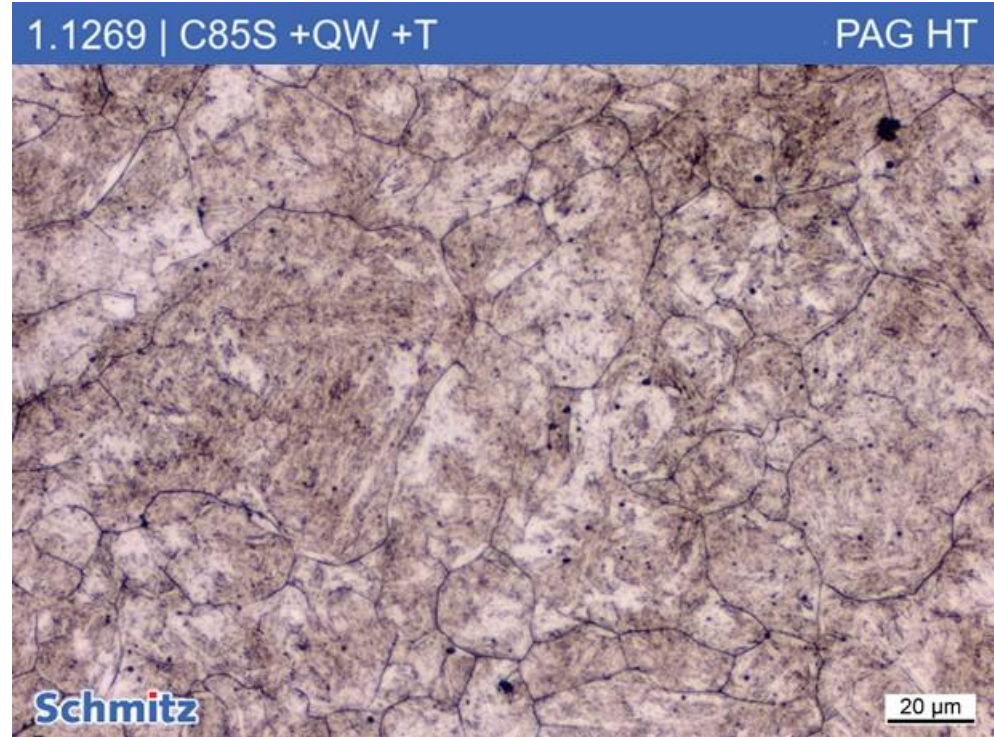
C85S | 1.1269 +QW +T

Etched with Nital and PAG HT



■ Time: 15 s

■ Temperature: 22 °C | 72 °F



■ Time: 3 min

■ Temperature: 22 °C | 72 °F

Quelle:

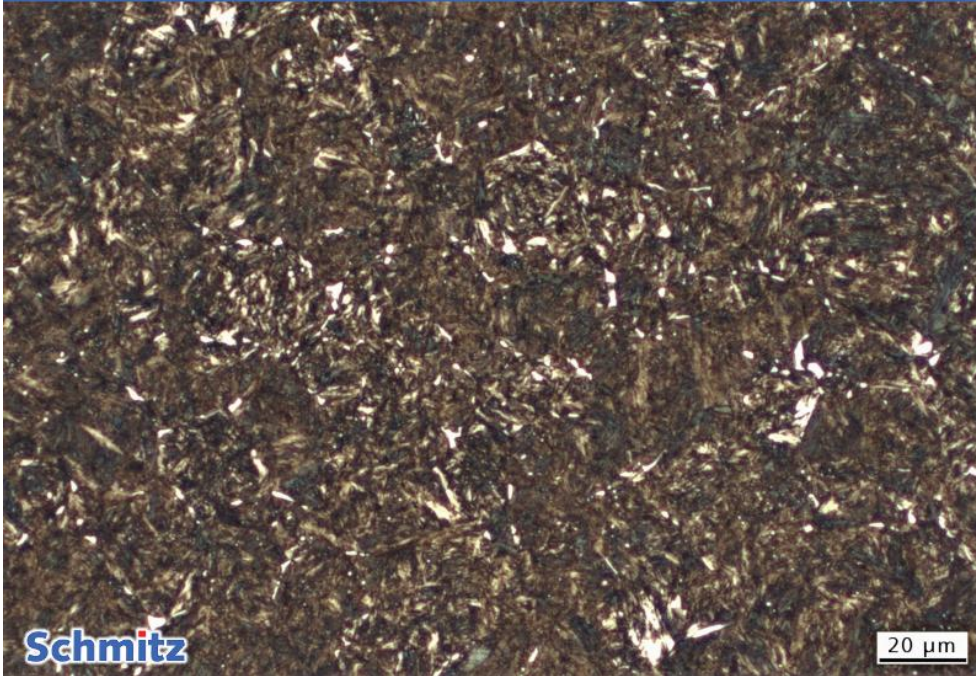
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C100S | 1.1274 +QW +T

Etched with Nital and PAG HT

1.1274 | C100S +QW +T

3 % Nital

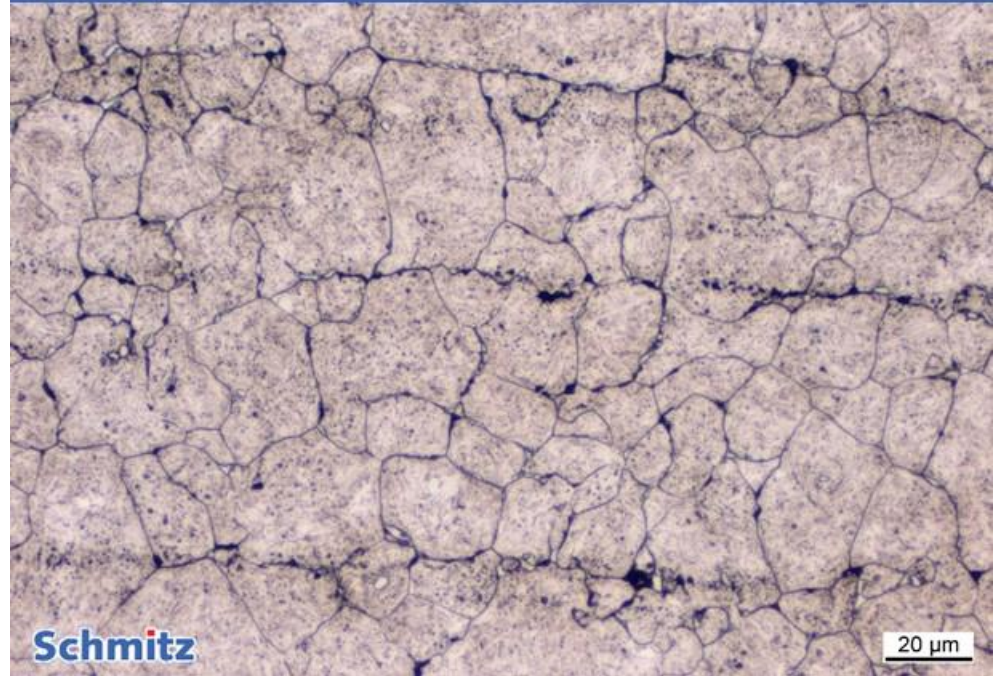


■ Time: 15 s

■ Temperature: 22 °C | 72 °F

1.1274 | C100S +QW +T

PAG HT



■ Time: 3 min

■ Temperature: 22 °C | 72 °F

Quelle:

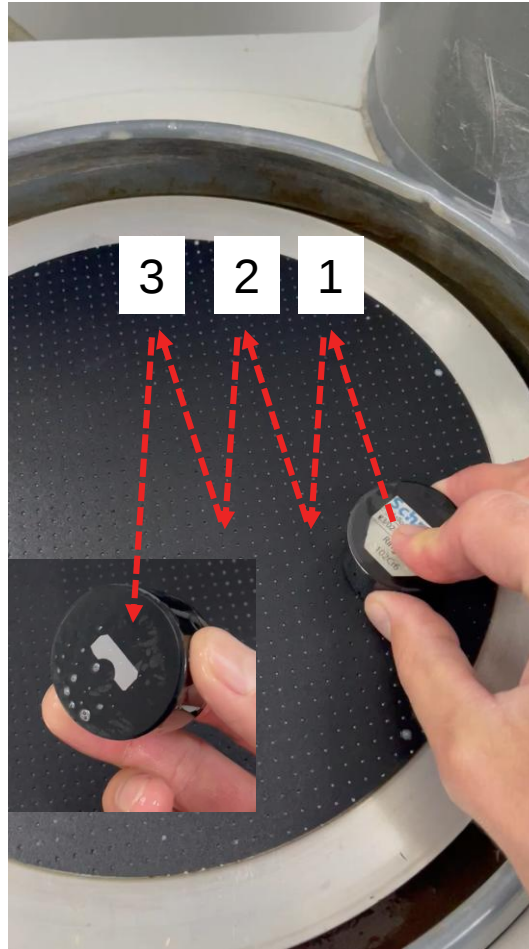
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Etching technique

PAG QT² and PAG HT



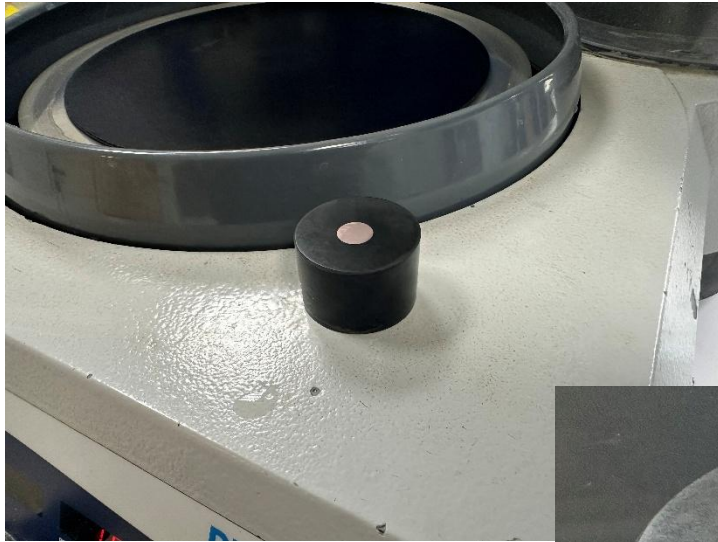
- 3 min Immersion etching at room temperature
- Wipe off oxide layer on non-rotating, wet OPS polishing cloth
- Repeat etching and wiping 2-3 times
- Finished

Quelle:

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Etching technique

PAG HT

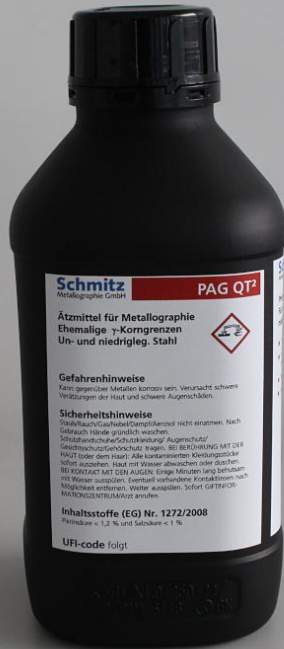


- When etching with PAG HT, a thin copper layer may form on the sample surface.
- For most materials, this can be easily removed by briefly polishing it off on the OPS polishing cloth.
- If this is not sufficient, the layer can be wiped off with ammonia (5 to 10 s with cotton-wool ball).

Quelle:

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Prior Austenite Grain boundaries etching reagent **PAG QT²** and **PAG HT** made by Schmitz



made by
Schmitz



made by
Schmitz

- <https://metallographie.shop/Aetzmittel>
- <https://metallographie.shop/Etching>

Quelle:

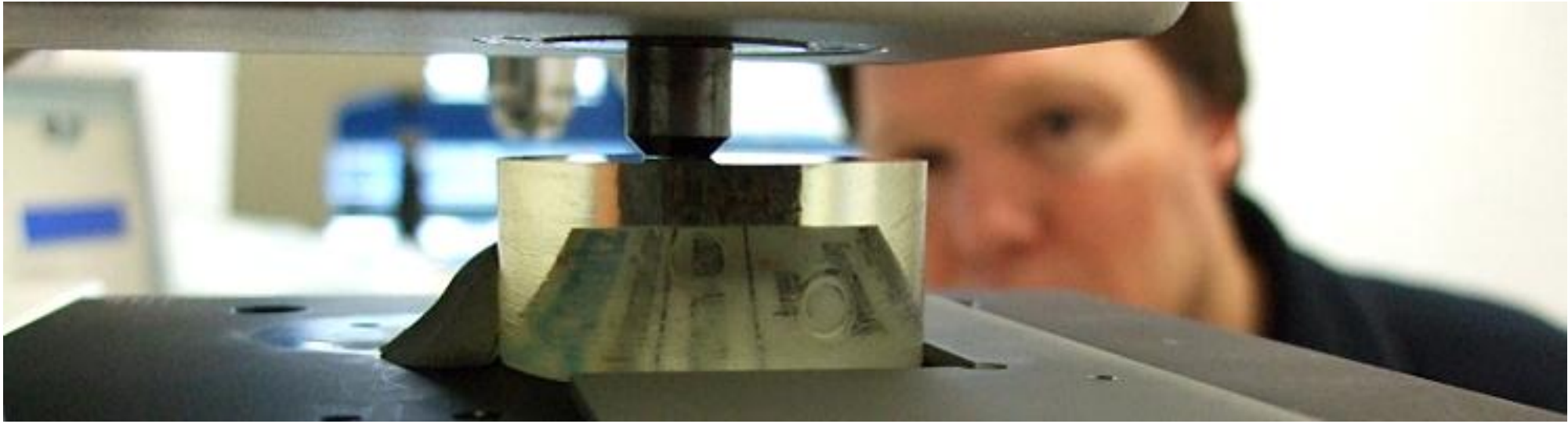
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