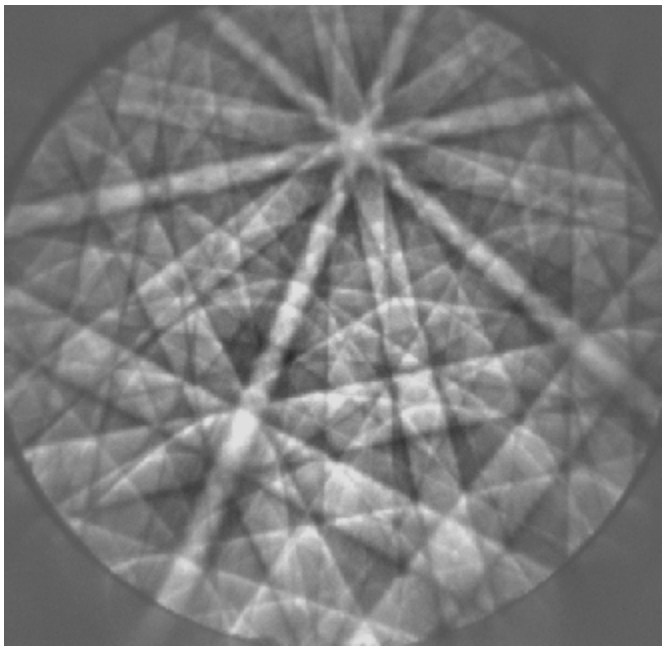
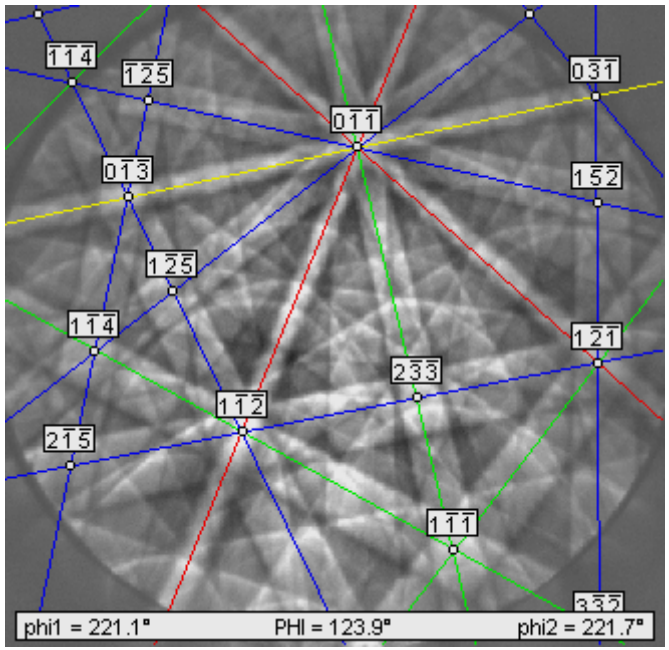
EBSD analysis

1 point de mesure :



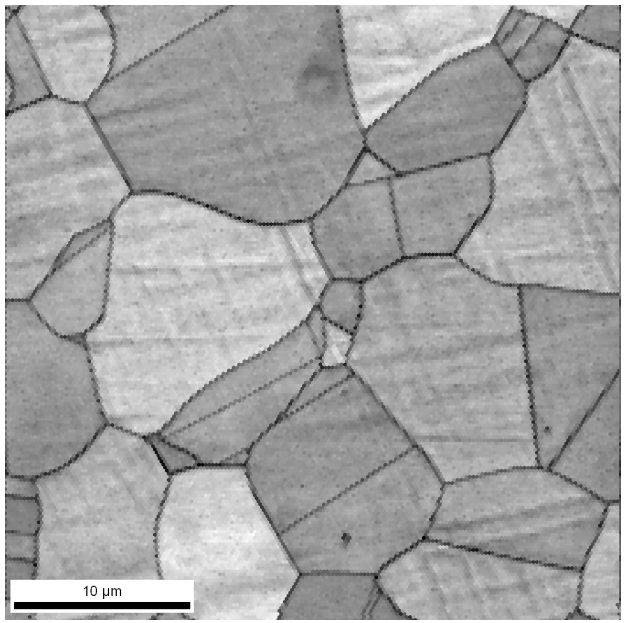


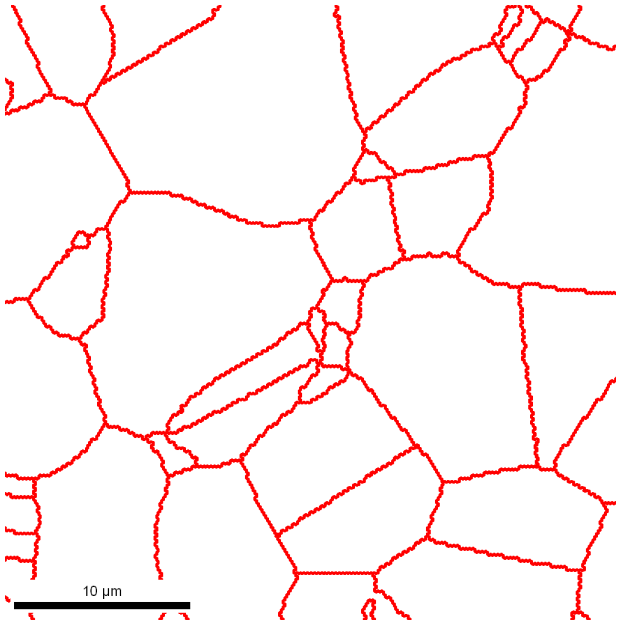
orientation

position

Show	phi1	PHI	phi2	IQ	CI	fit	x	y	phase
☐ 804	80.6	58.7	18.7	55.2	0.486	1.000	-10.00	-45.73	fcc_generic

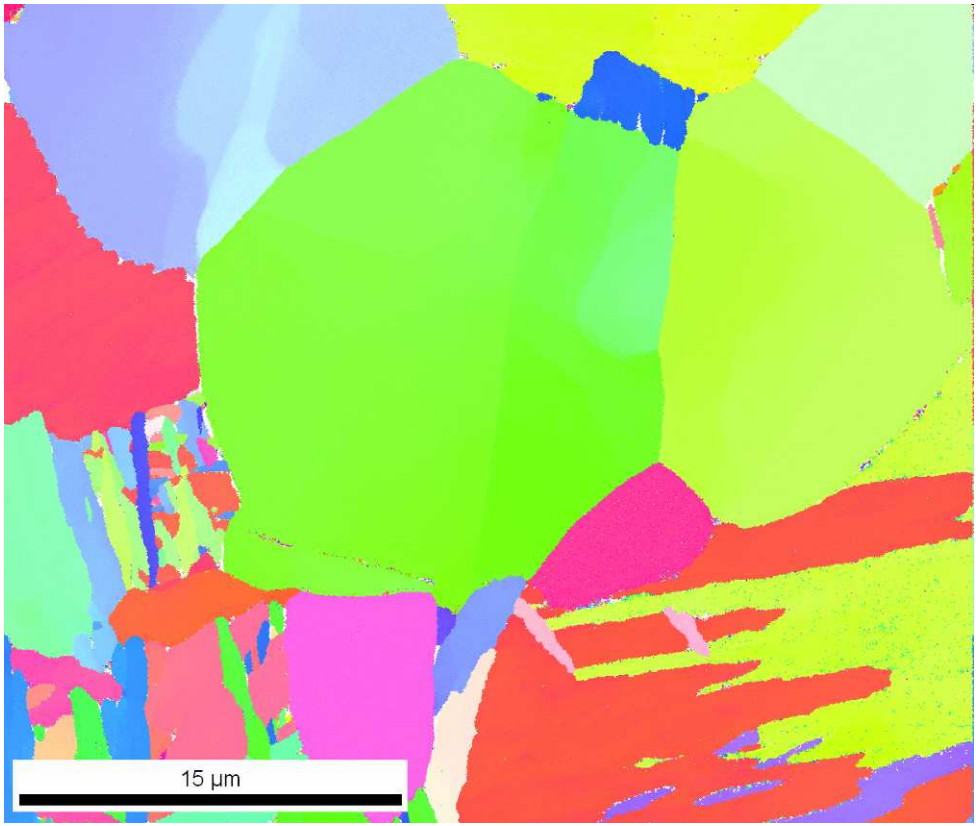
Grains boundary

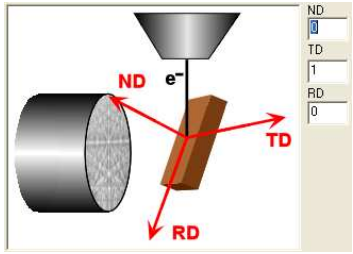




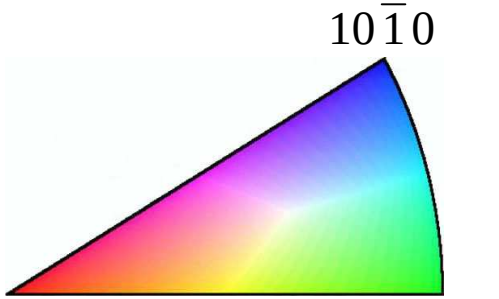
Stainless steel ferrite - austenite

Ti alloy bimodal microstructure





Mapping along
TD direction

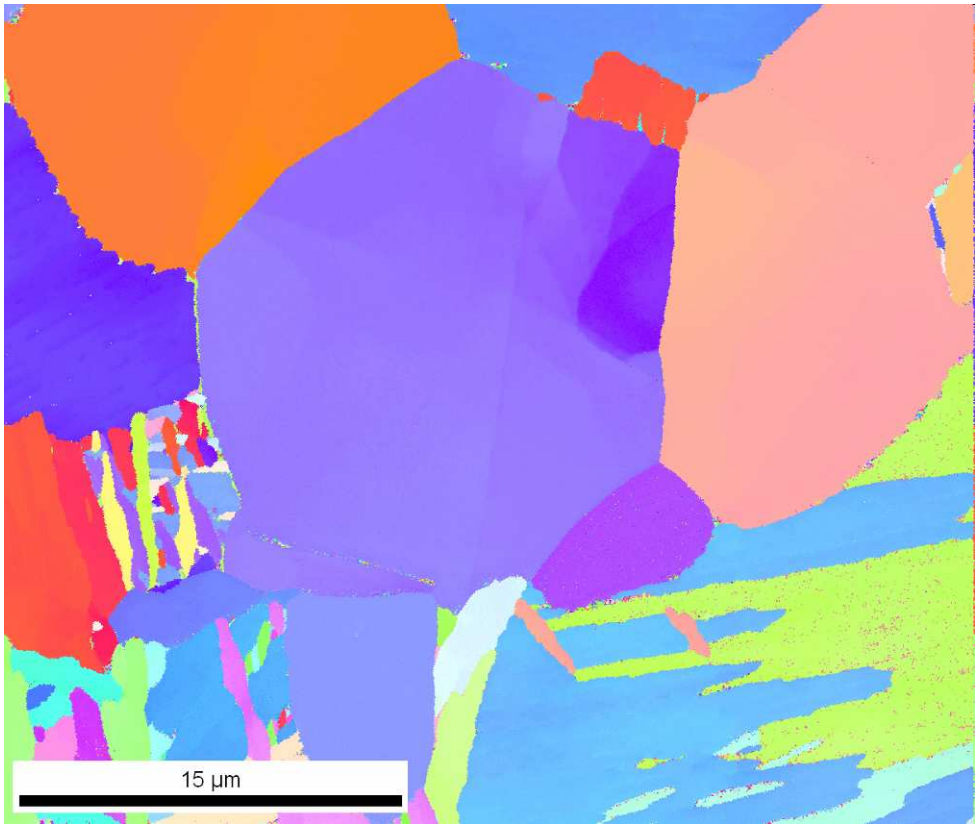


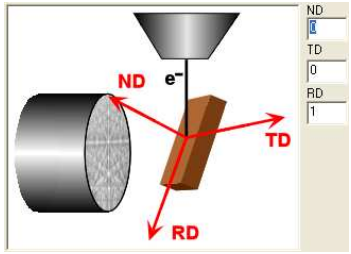
RD

ND (surface normal)

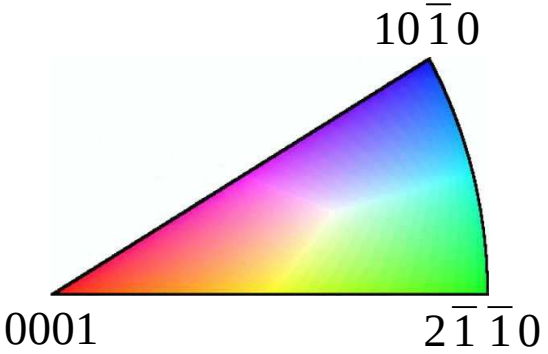
TD

Ti alloy bimodal microstructure

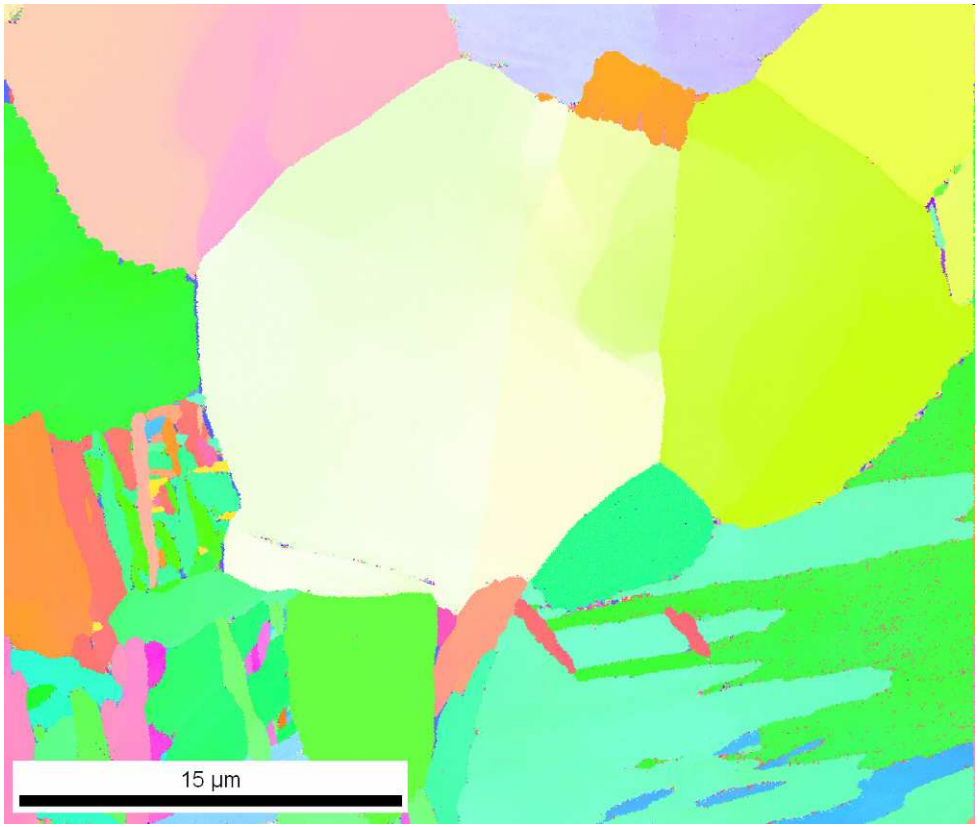




Mapping along
RD direction



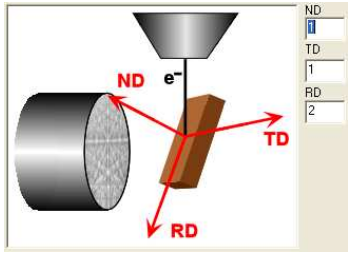
Ti alloy bimodal microstructure



RD

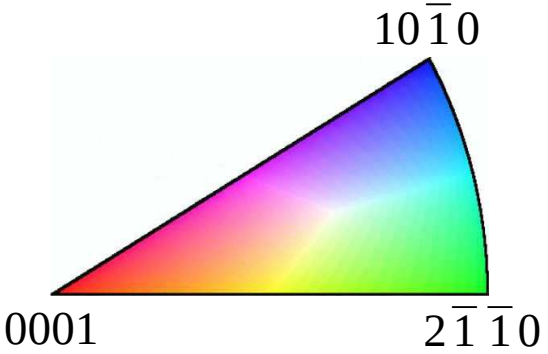
ND (surface normal)

TD

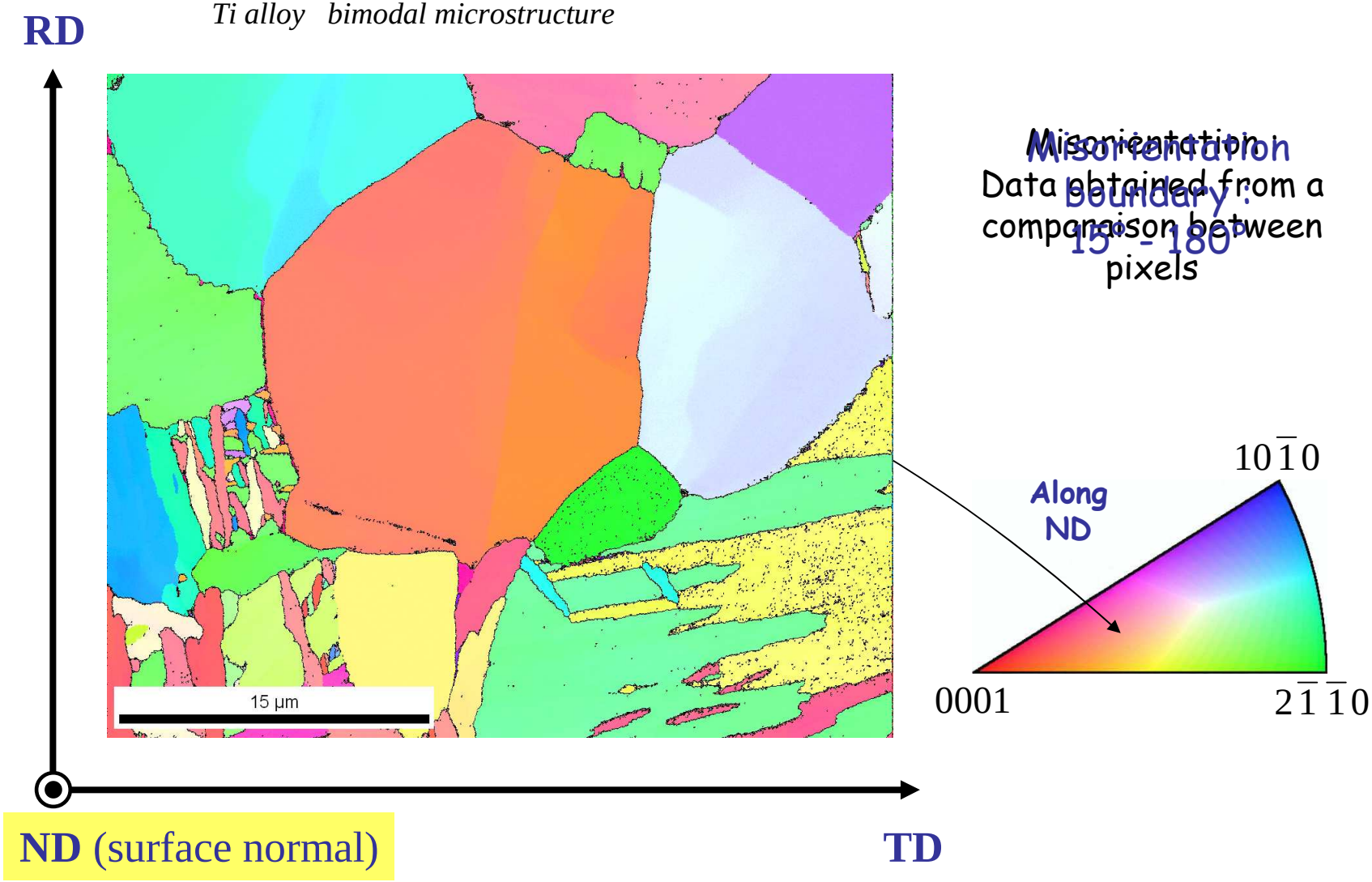


Mapping along the direction:

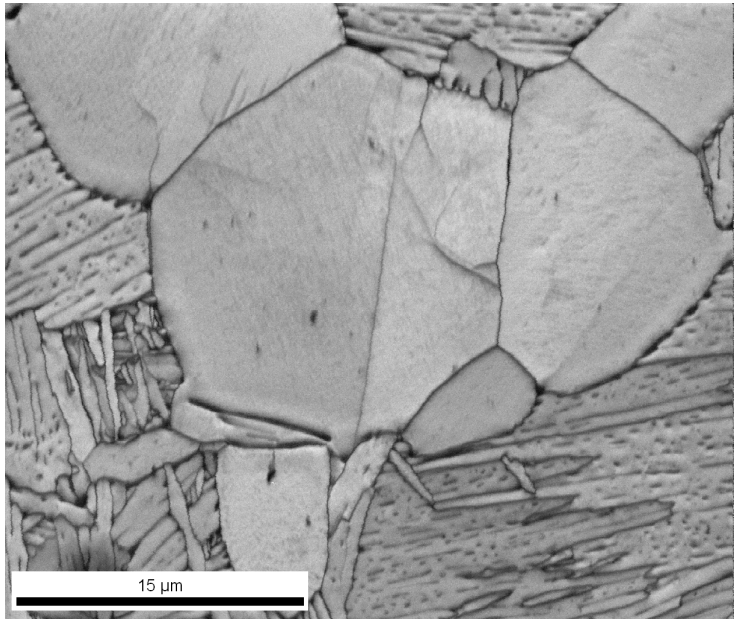
[1 ND – 1 TD – 2 RD]

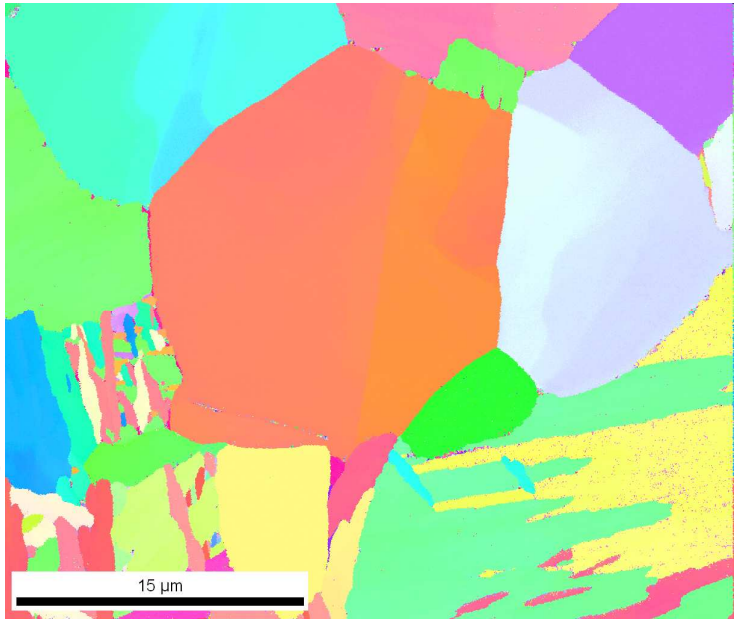


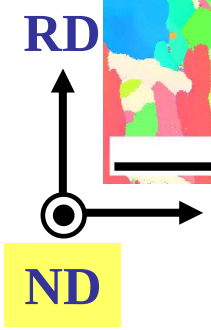
Ti alloy bimodal microstructure



Ti alloy bimodal microstructure

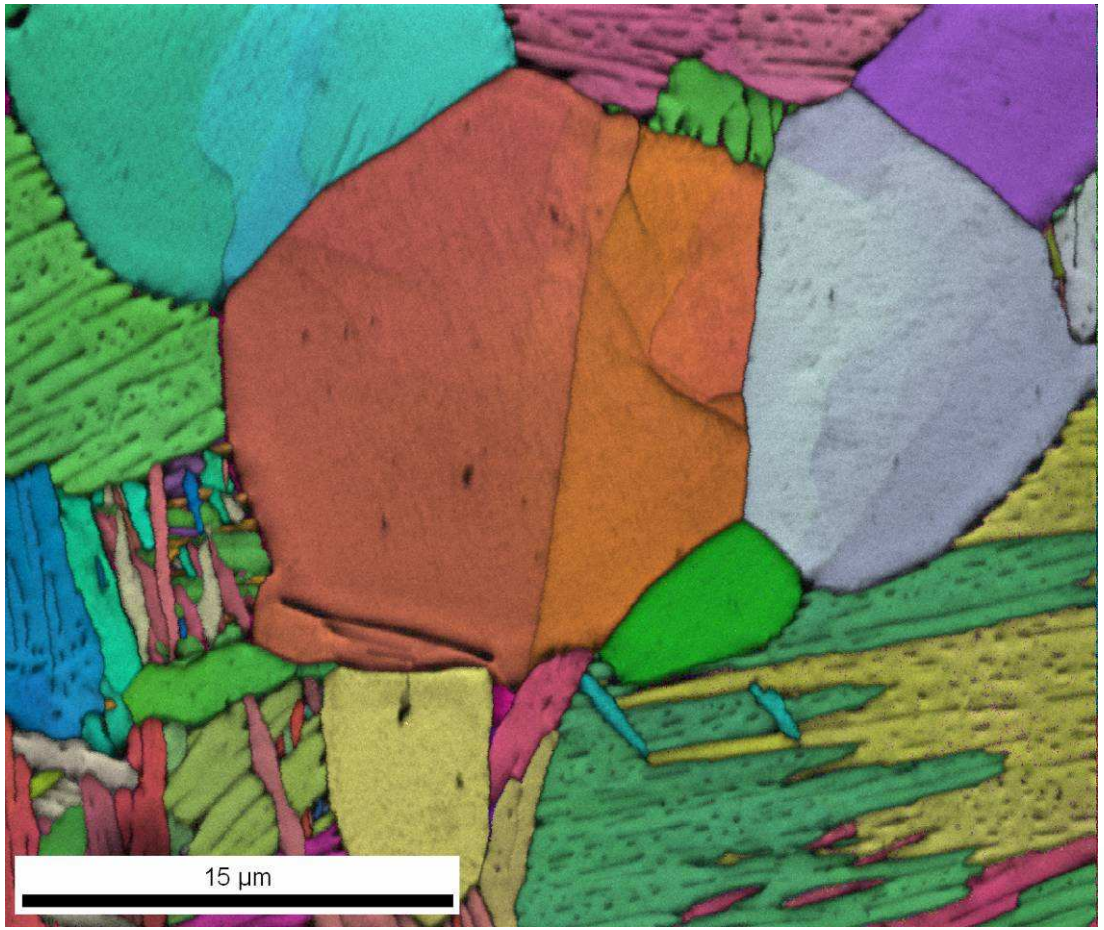


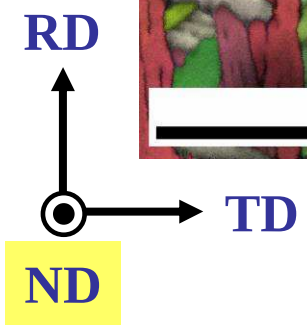


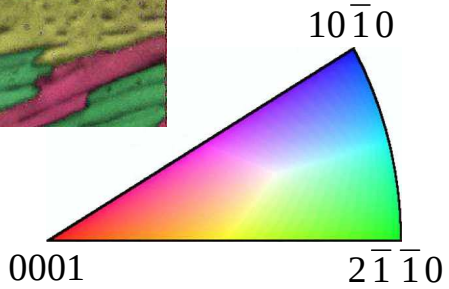


mixture of information

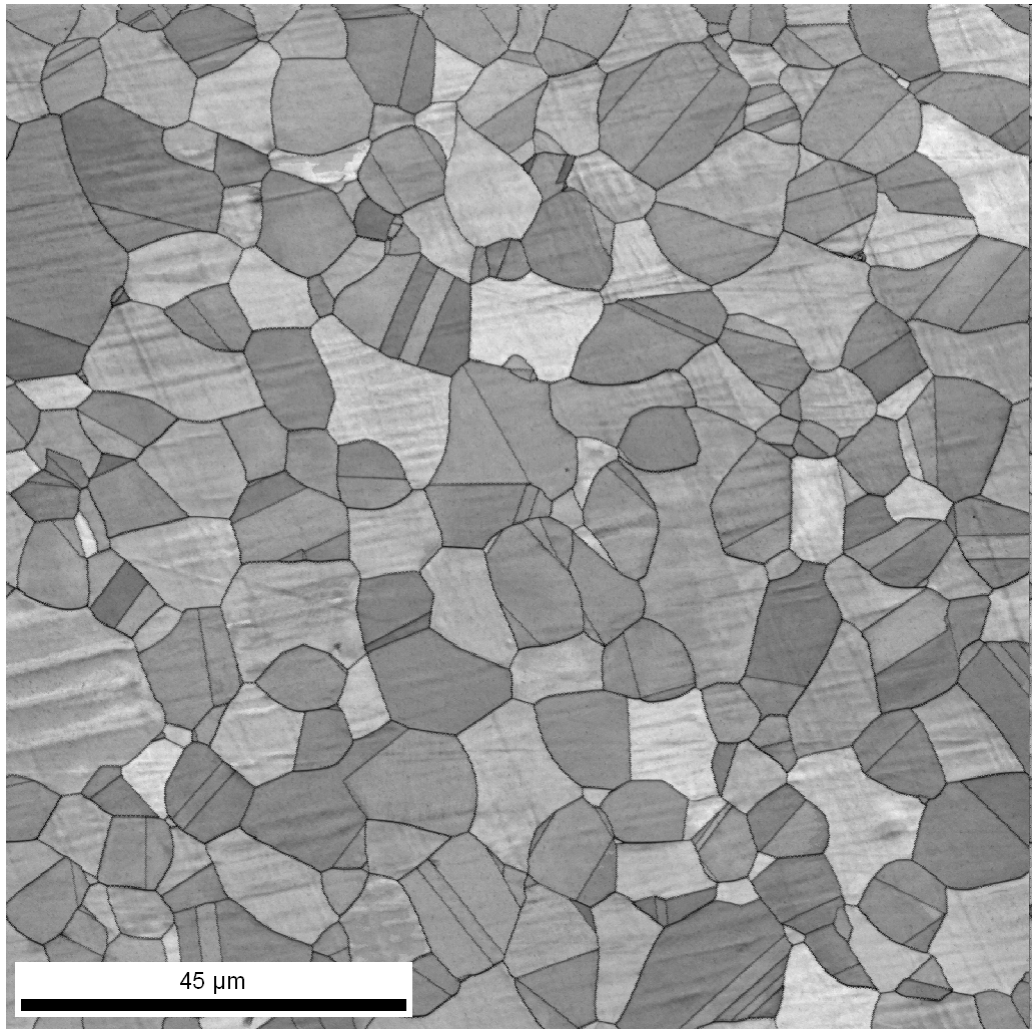
Ti alloy bimodal microstructure







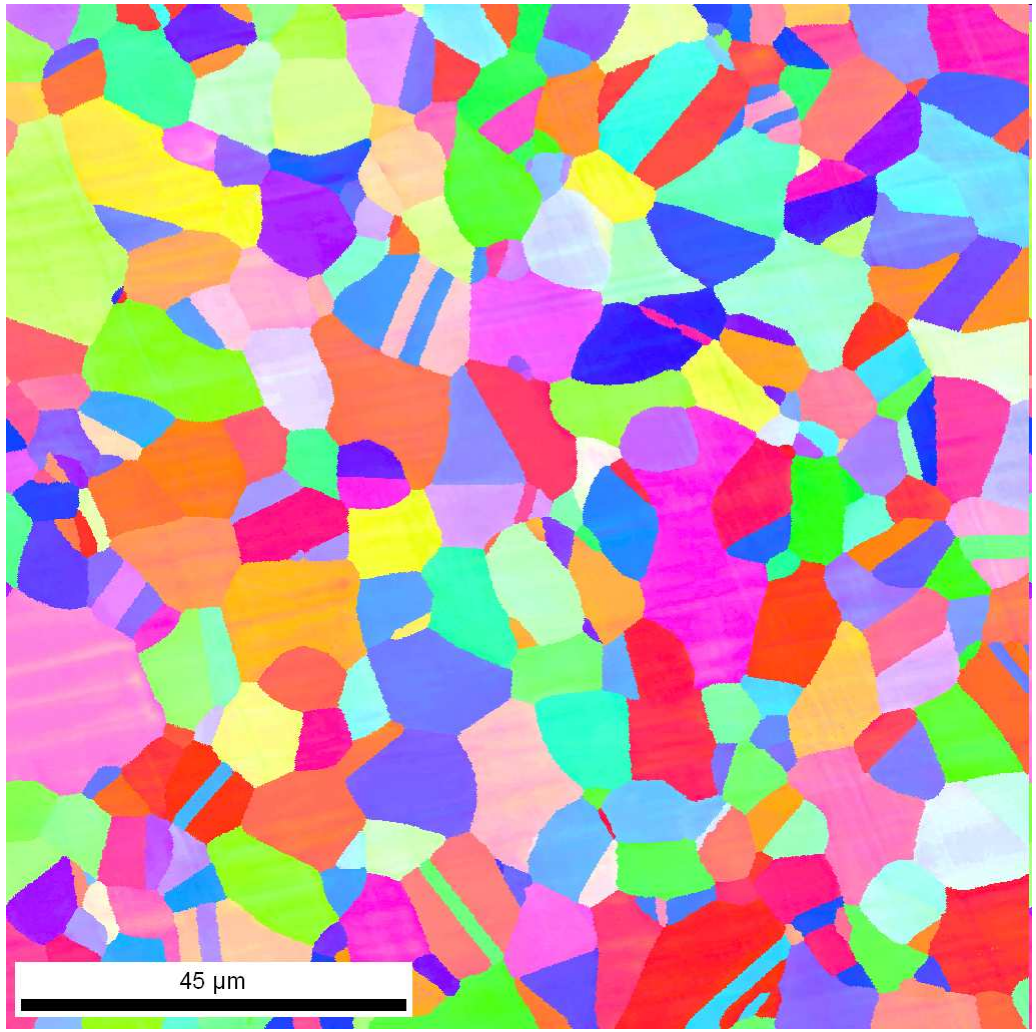
Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Microstructure
Grain boundary visualisation

Duplex stainless steel

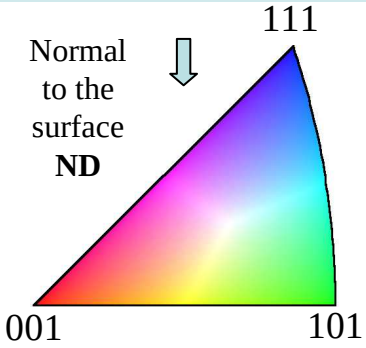


120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

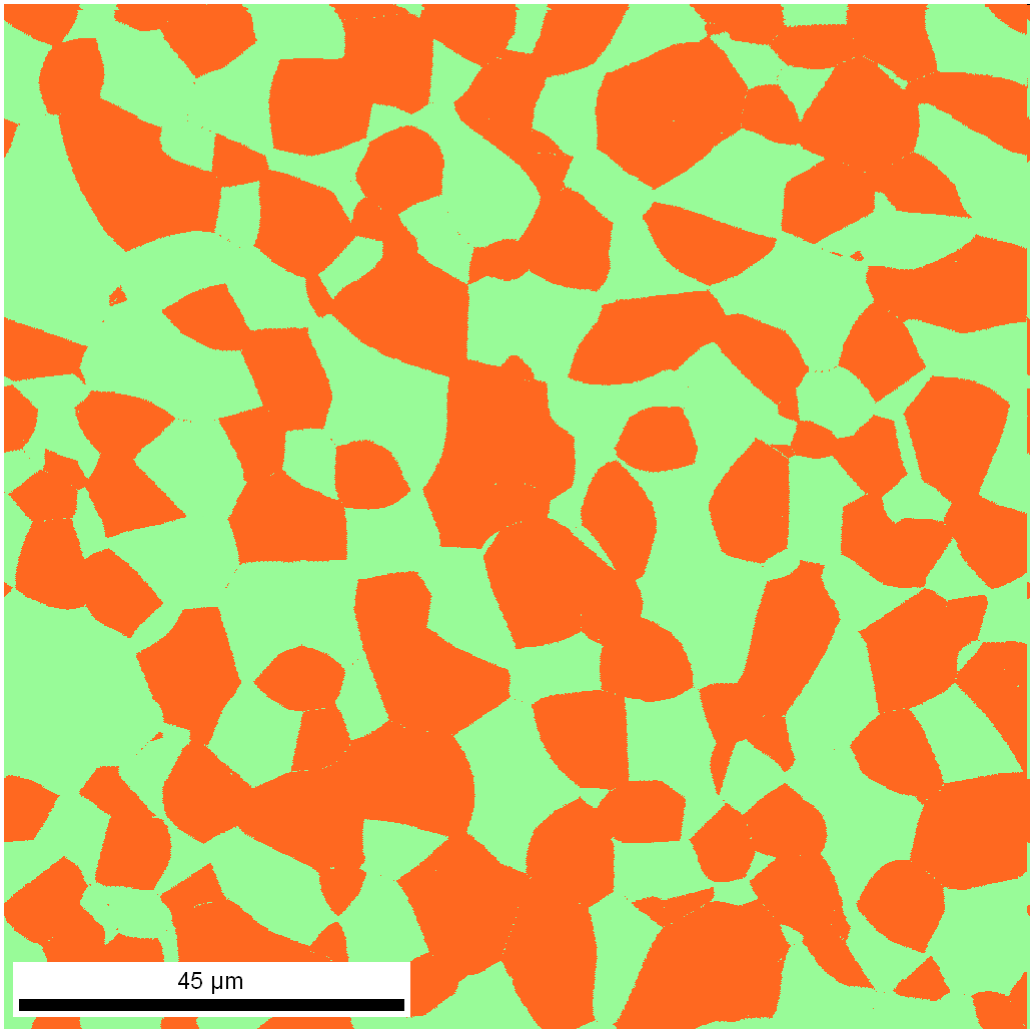
Microstructure
Grain boundary visualisation

⇩

Orientation



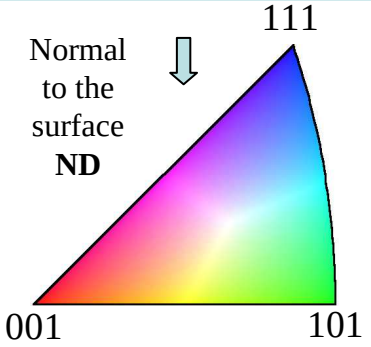
Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Microstructure
Grain boundary visualisation

Orientation

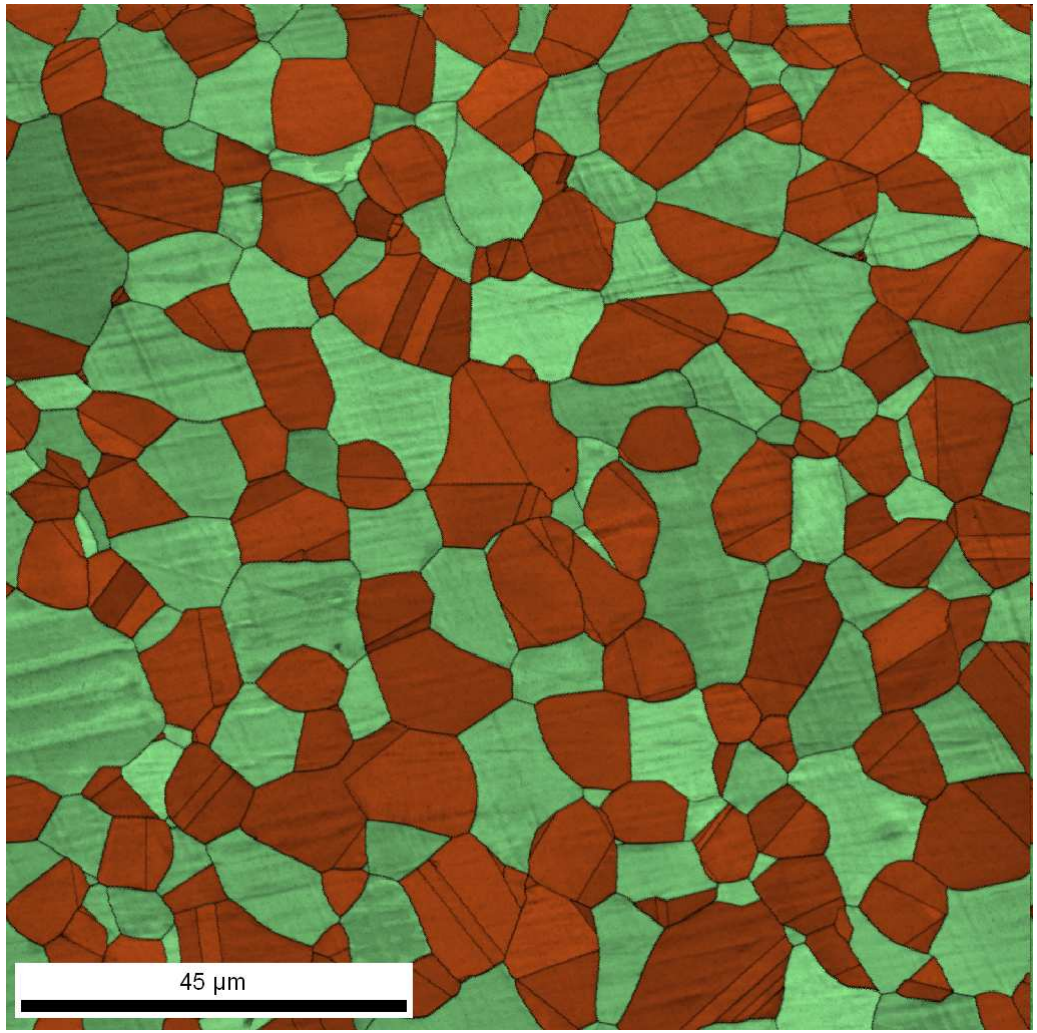


Phases

austénite

ferrite

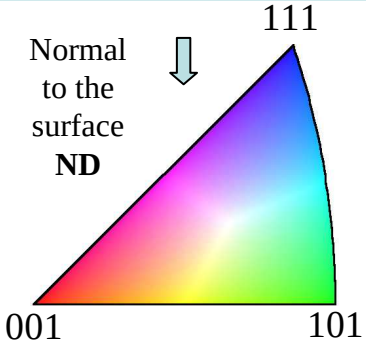
Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Microstructure
Grain boundary visualisation

Orientation

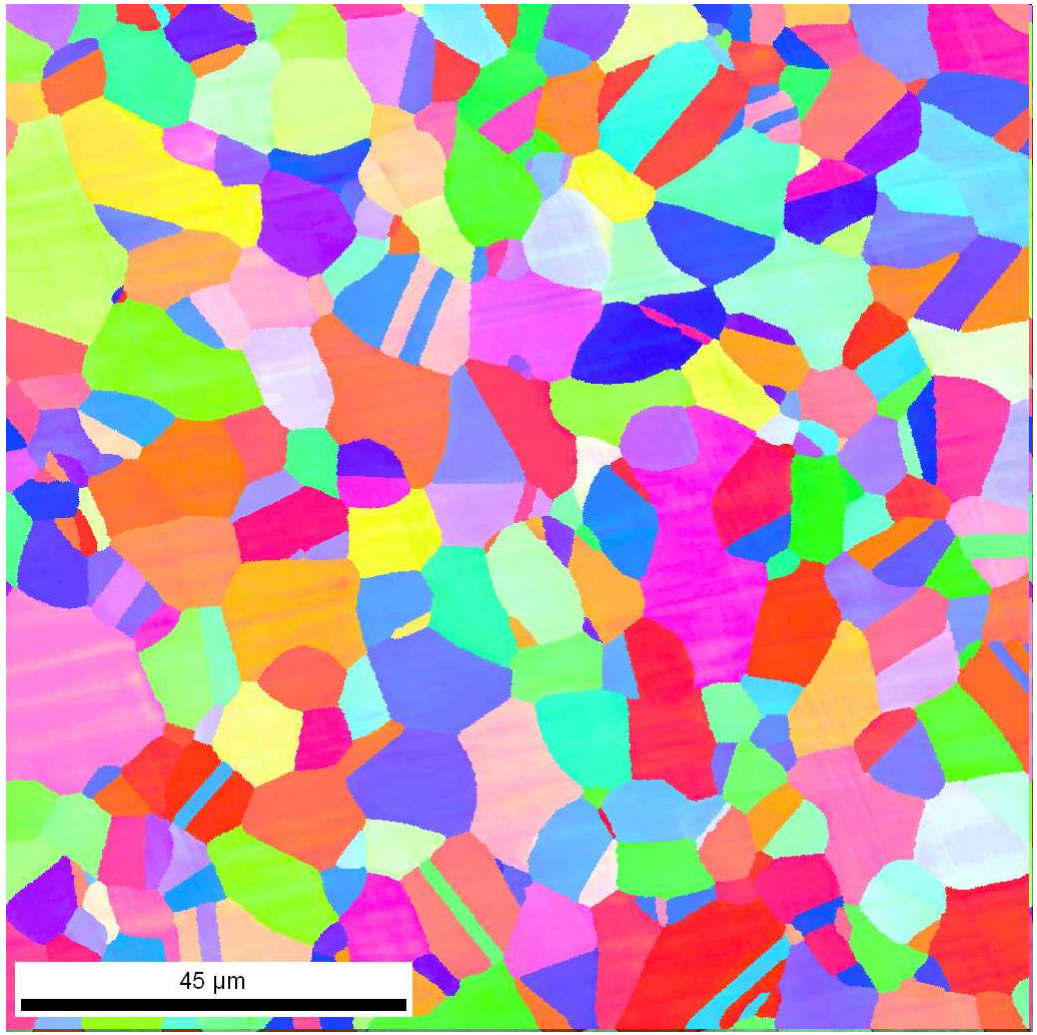


Phases

austénite

ferrite

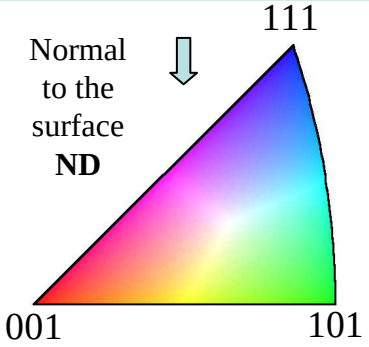
Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Microstructure
Grain boundary visualisation

Orientation

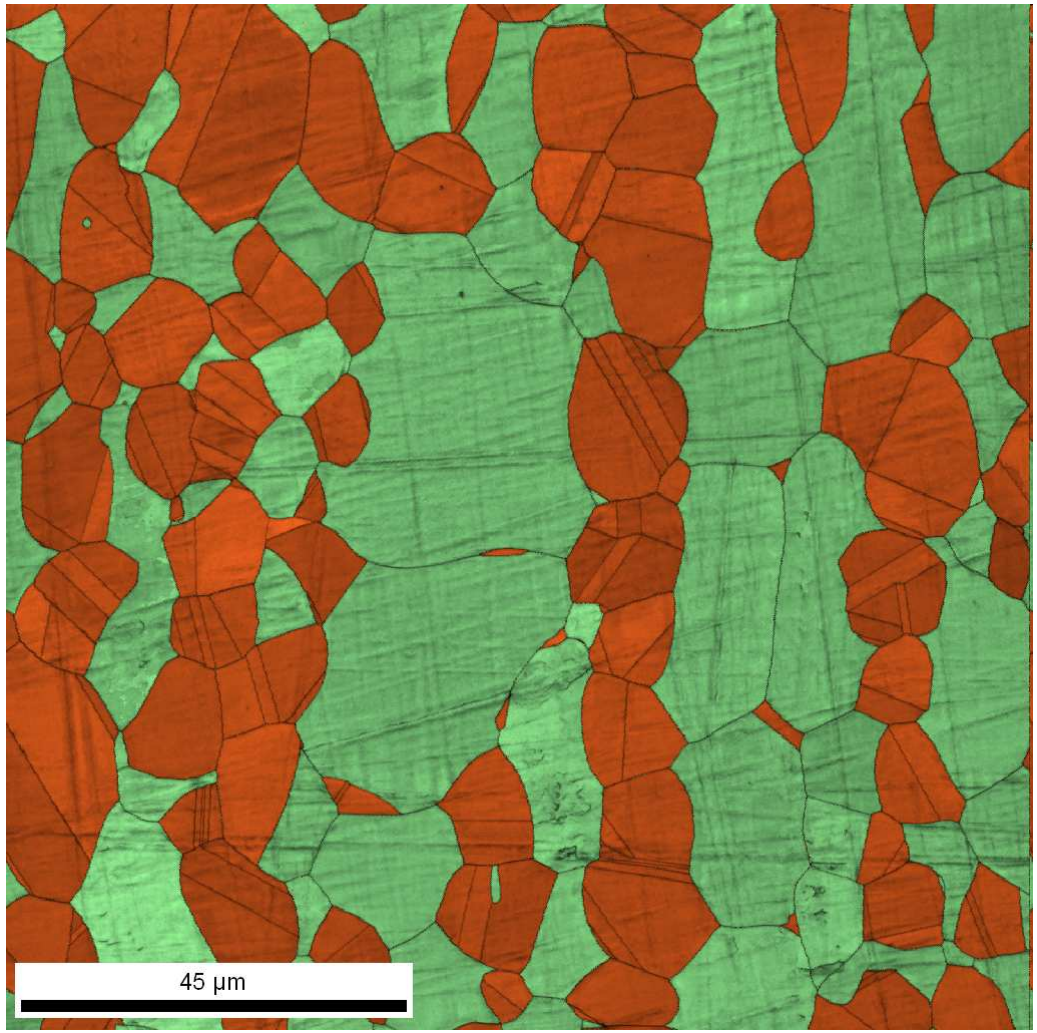


Phases

austénite

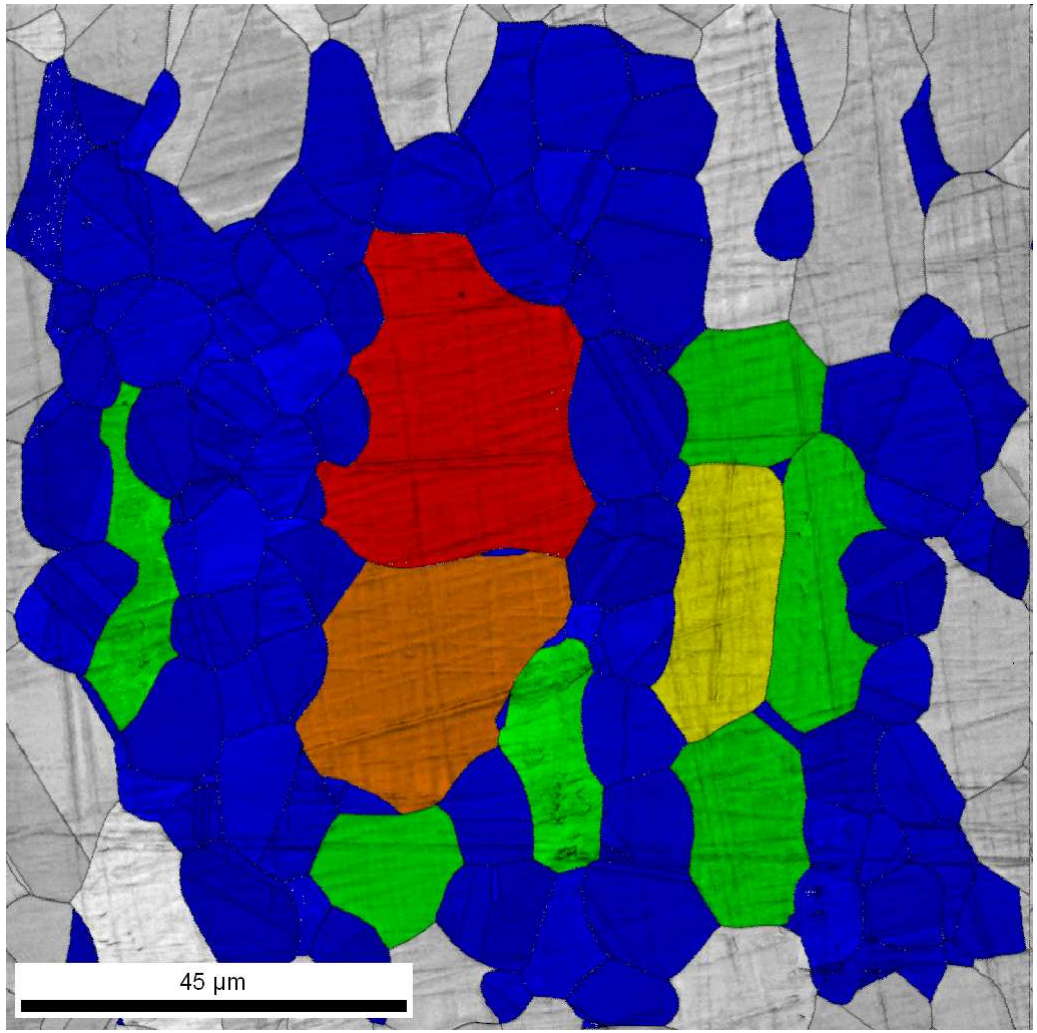
ferrite

Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Grains size

⇩

diameter

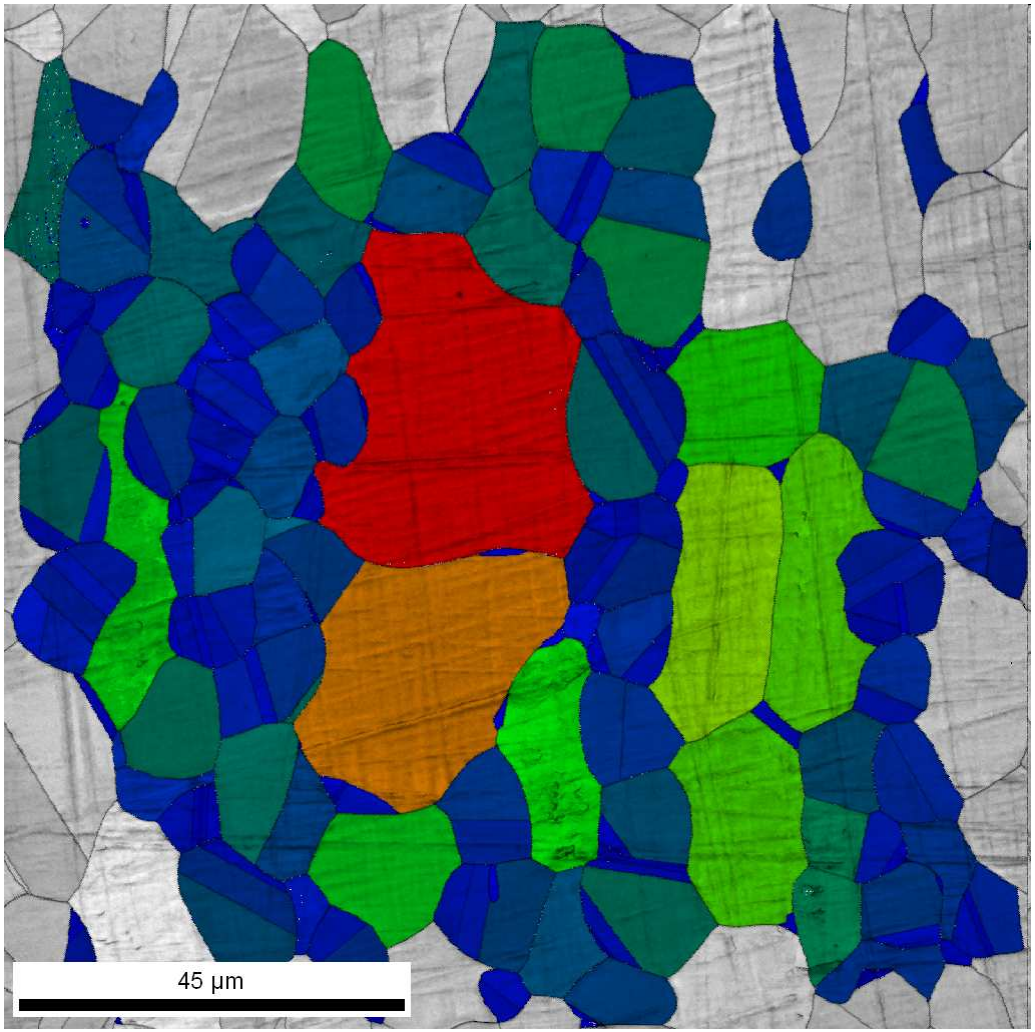
(starting from the surface area, the grain is associated to a circle, and the diameter is calculated)

Color Coded Map Type: Grain Size

	Min	Max	Total Fraction	Partition Fraction
	0.222755	15.091	0.471	0.471
	15.091	21.3408	0.102	0.102
	21.3408	26.1365	0.025	0.025
	26.1365	30.1796	0.044	0.044
	30.1796	33.7416	0.062	0.062

« diameter » (µm)

Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Taille de grains

⇩

diamètre

(A partir de l'aire, le grain est assimilé à un cercle, puis sont diamètre calculé)

Color Gradient

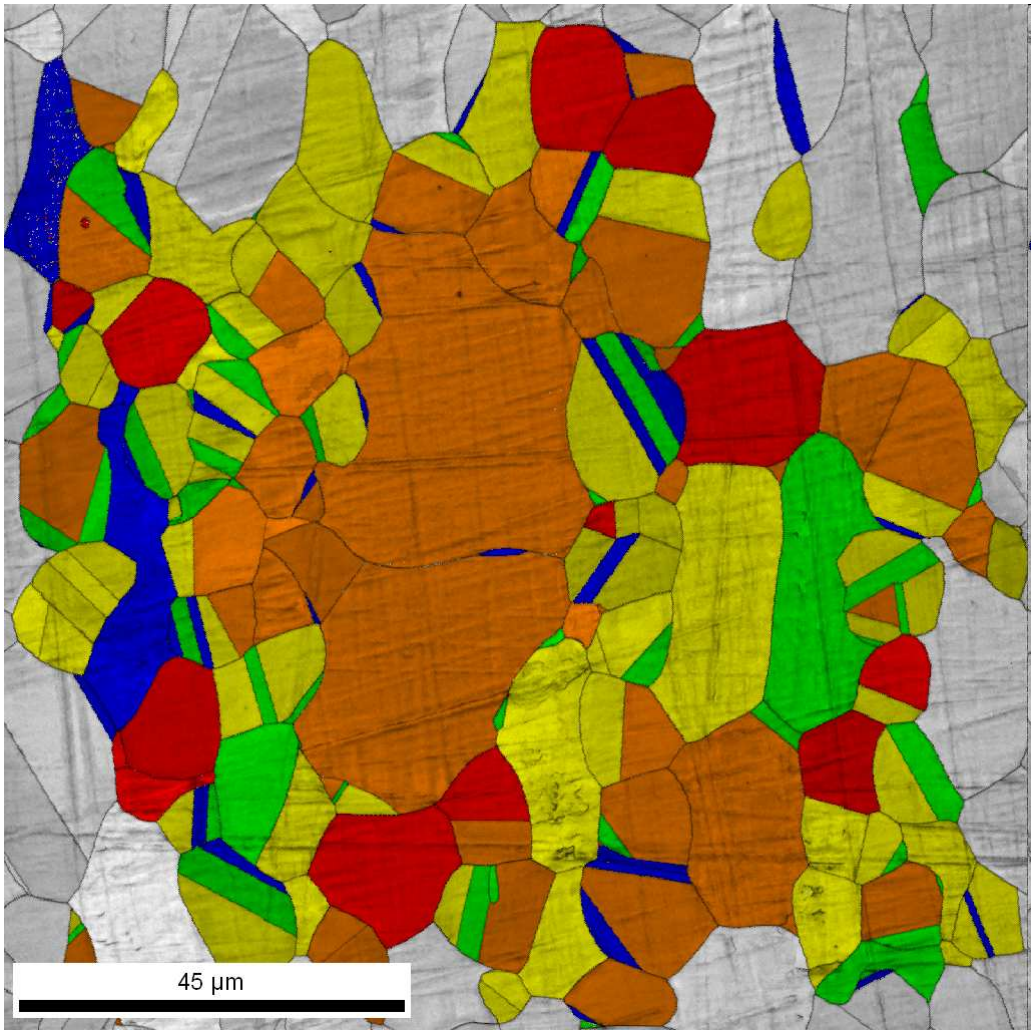
34µm

Color Coded Map Type: Grain Size

Min	Max	Total Fraction	Partition Fraction
0.222755	33.7416	0.704	0.704

« diamètre » (µm)

Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Grains shape

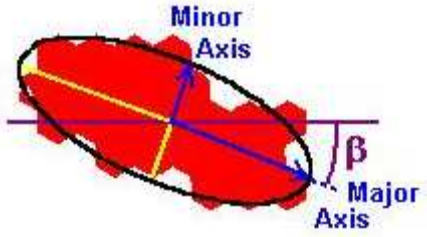
⇩

« aspect ratio »

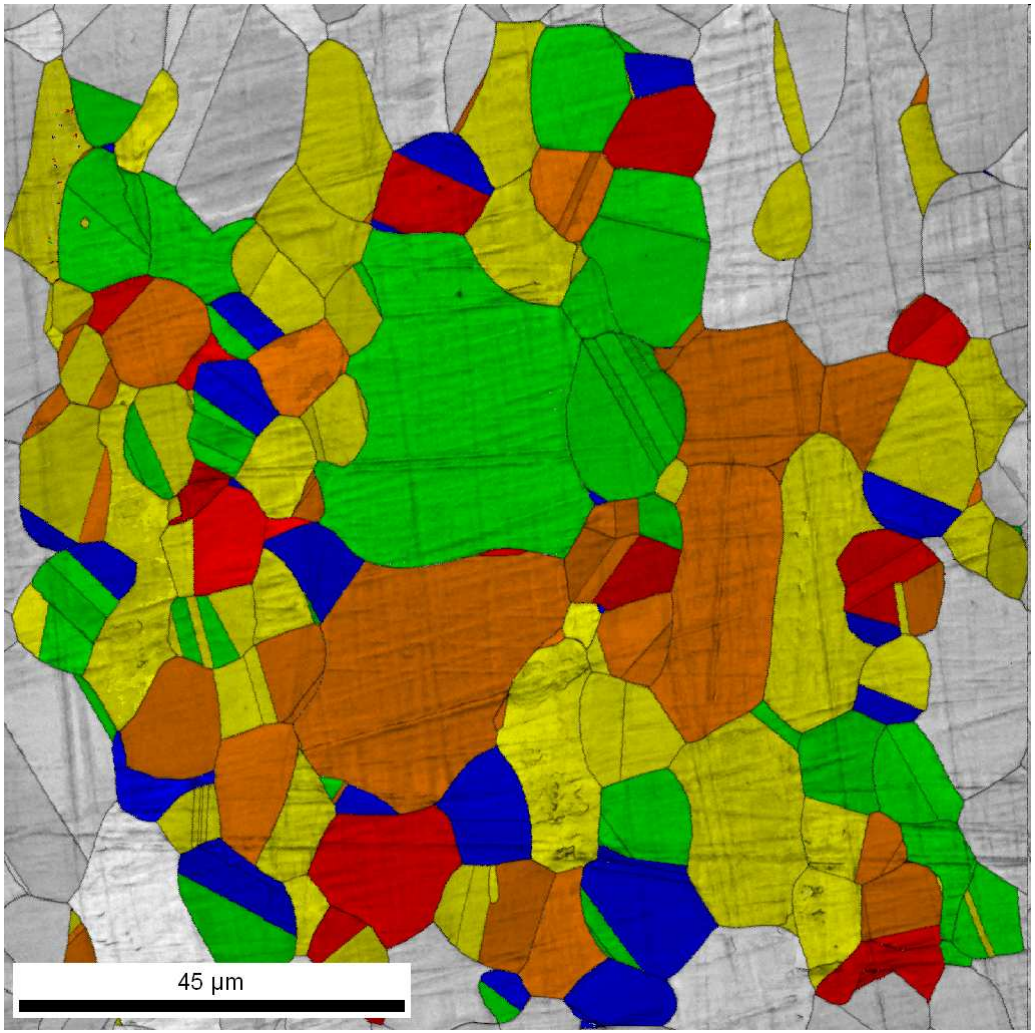
Color Coded Map Type: Grain Shape Aspect Ratio

	Min	Max	Total Fraction	Partition Fraction
	0.0516818	0.198633	0.042	0.042
	0.198633	0.345584	0.077	0.077
	0.345584	0.492535	0.227	0.227
	0.492535	0.639486	0.275	0.275
	0.639486	0.786437	0.084	0.084

Aspect ratio :
length of the minor axis /
length of the major axis



Duplex stainless steel



120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

Grains shape

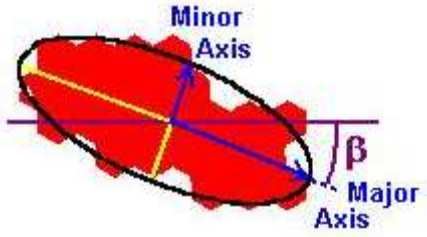
⇩

« grain shape orientation »

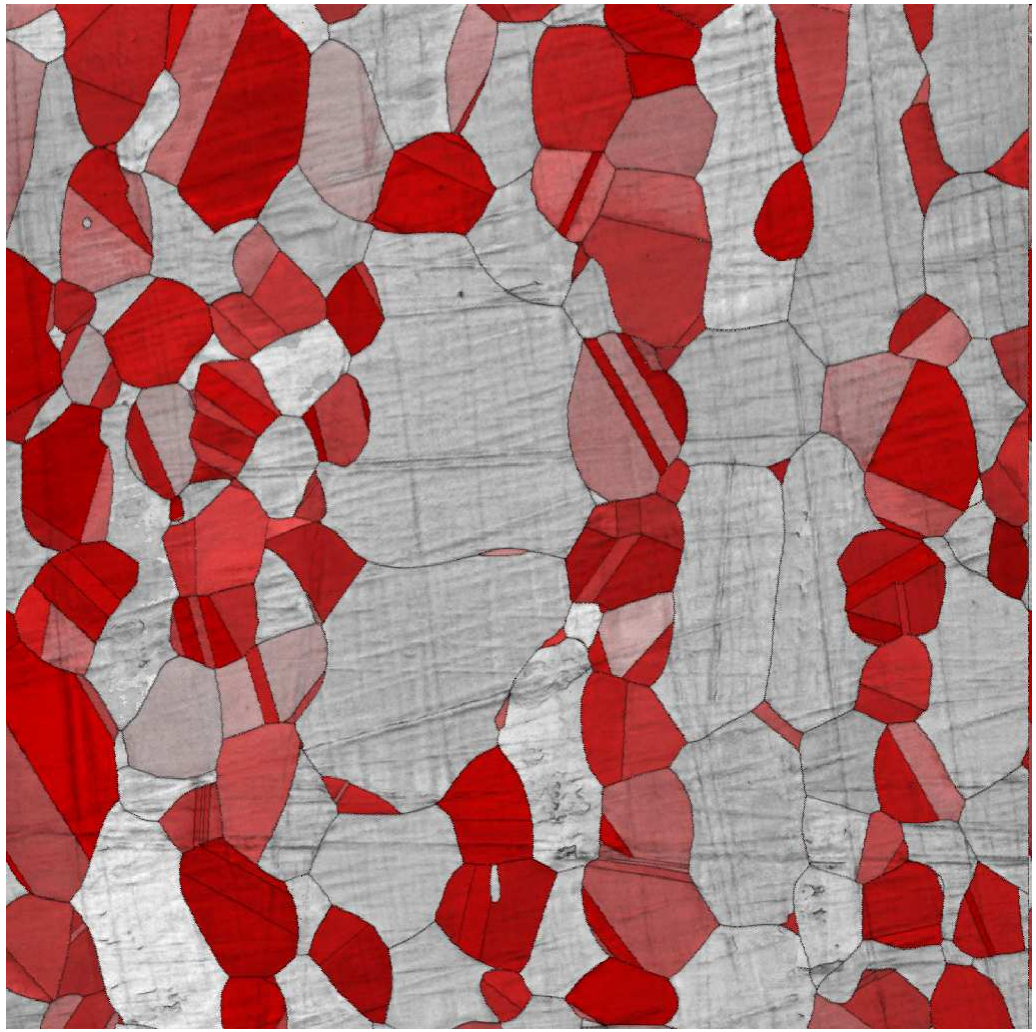
Color Coded Map Type: Grain Shape Orientation

	Min	Max	Total Fraction	Partition Fraction
	0	35.2117	0.058	0.058
	35.2117	70.4234	0.180	0.180
	70.4234	105.635	0.236	0.236
	105.635	140.847	0.172	0.172
	140.847	176.058	0.058	0.058

« Grain shape orientation » :
Angle β (°) entre le grand axe de l'ellipse et l'horizontale



Duplex stainless steel



RD

TD

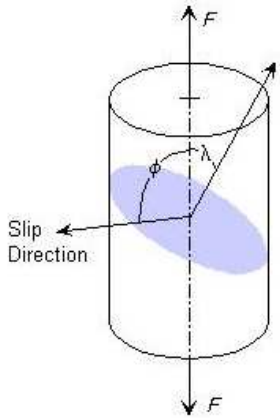
ND

120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

« mechanical properties »

⇩

«Schmid factor m »

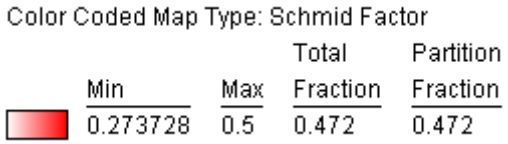


$$\sigma_y = m\,\tau_{CRSS}$$

$$\frac{1}{m} = \cos\phi\cos\lambda$$

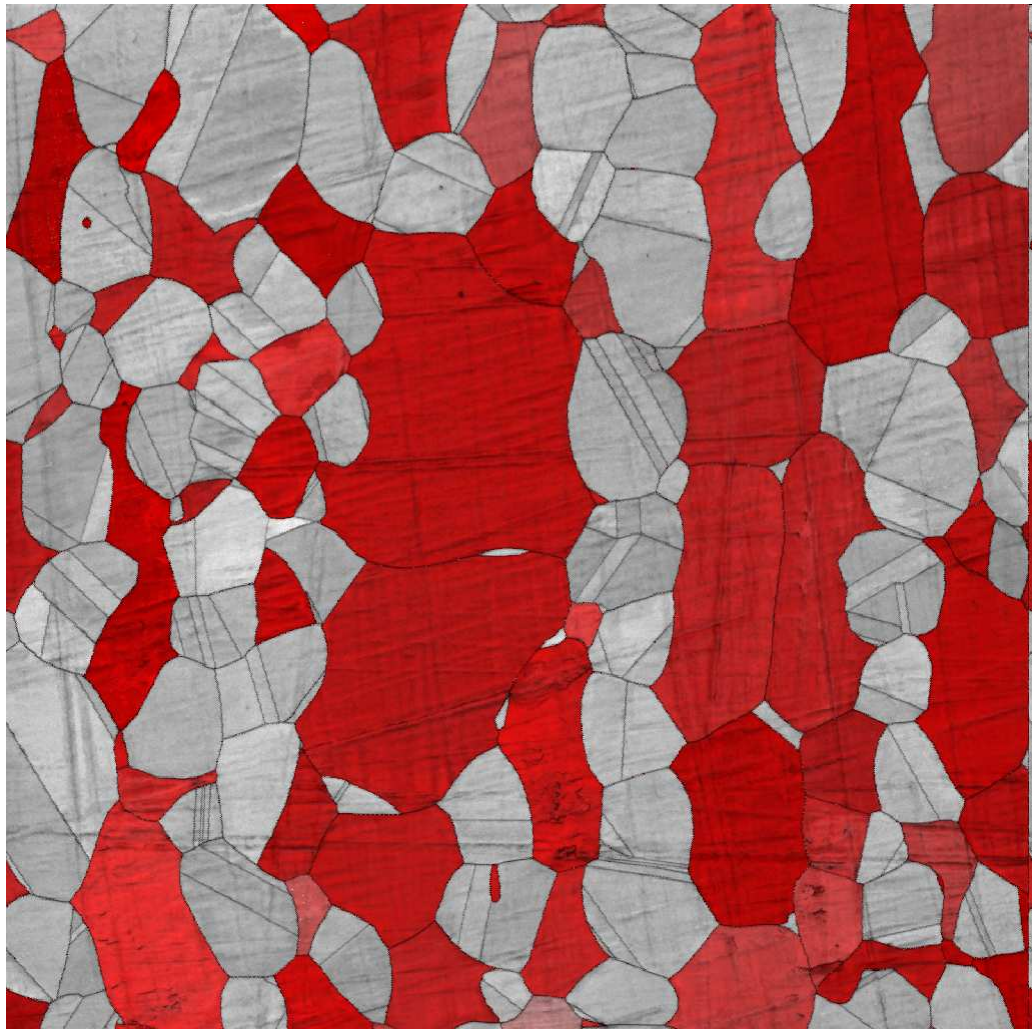
Example of austenite (fcc) :

Active Gliding systems : {111}<110>
Tensile direction : RD



0 0,5

Duplex stainless steel



RD

TD

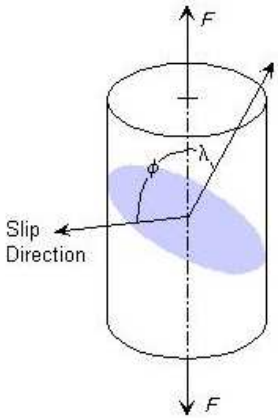
ND

120 µm x 120 µm – pas de 0,2 µm – 0,5 nA

« mechanical properties »

⇩

«Schmid factor m »

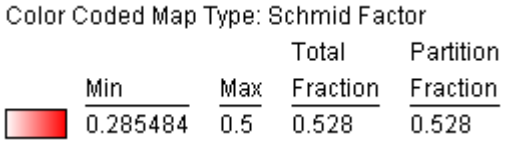


$$\sigma_y = m\,\tau_{CRSS}$$

$$\frac{1}{m} = \cos\phi\cos\lambda$$

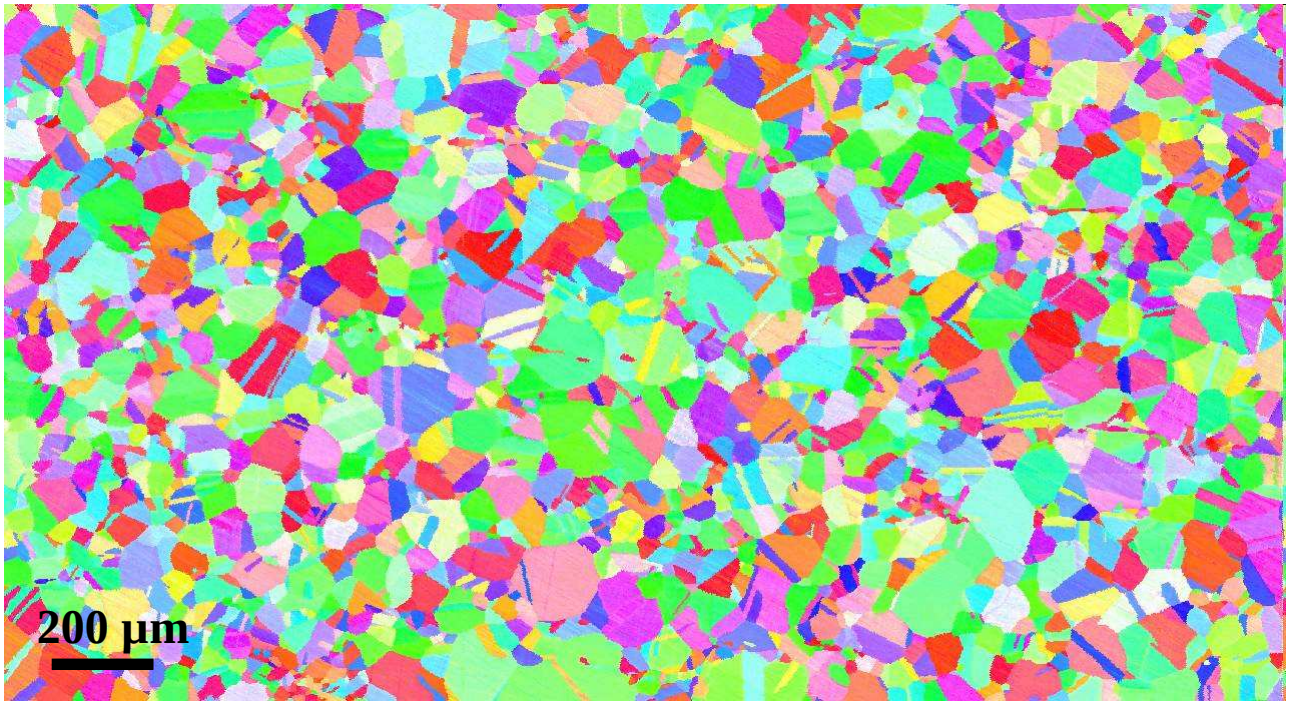
Example of ferrite (bcc) :

Active Gliding systems : {110}<111>
Tensile direction : RD

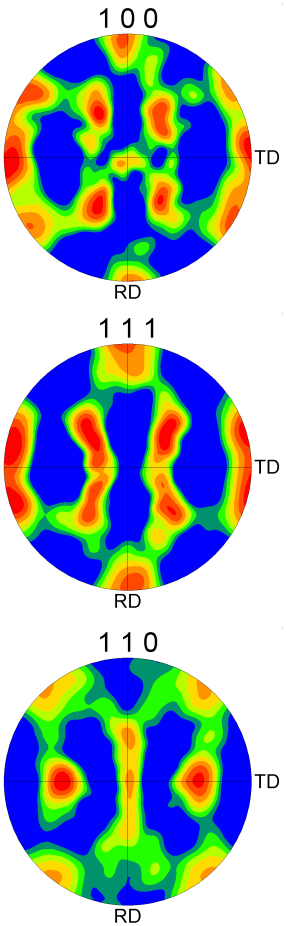


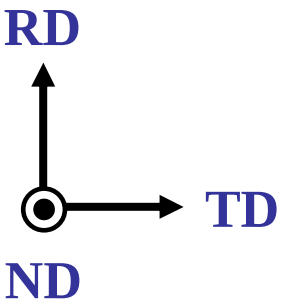
0 0,5

Informations « before / after » …



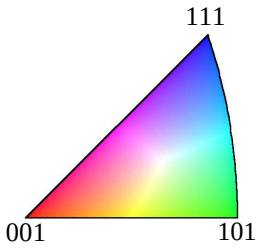
Stainless steel 316L *≈2 mm x 1 mm – pas de 2 µm*





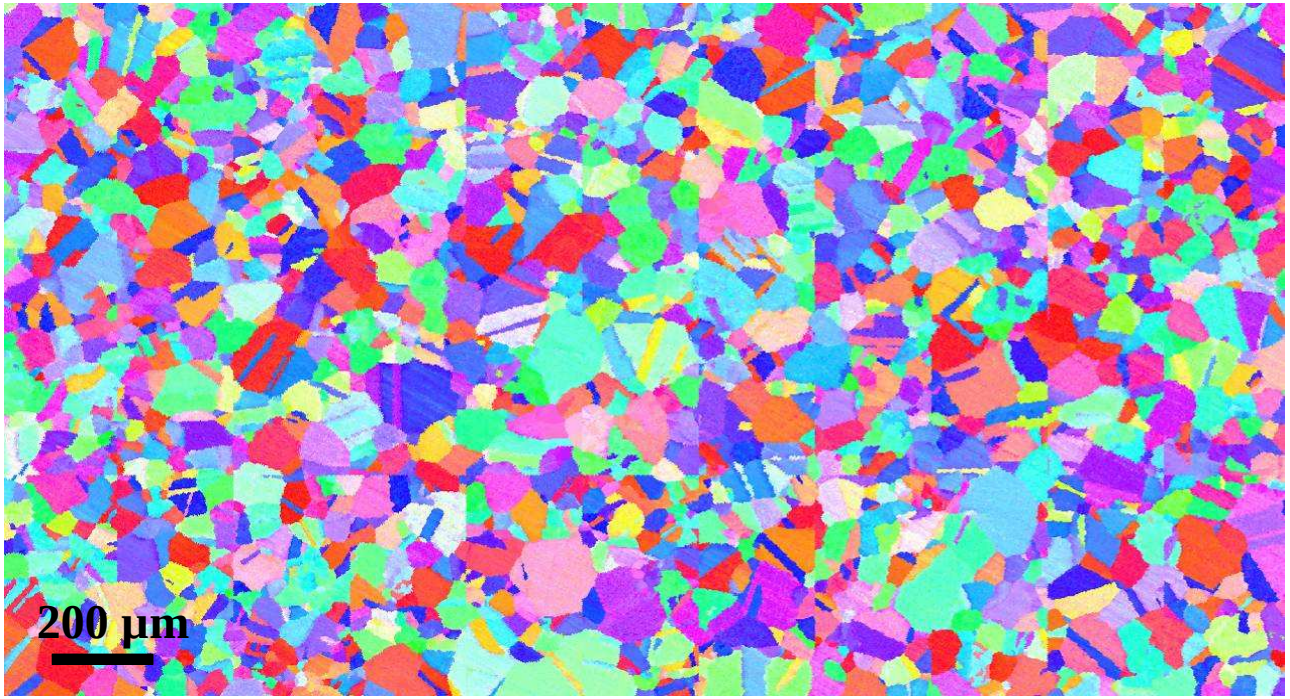
Orientation

Normal to the surface **ND**



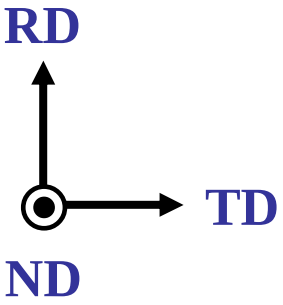
Informations « before / after » …

Plasma Nitriding 1h



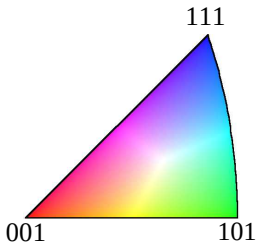
Stainless steel 316L

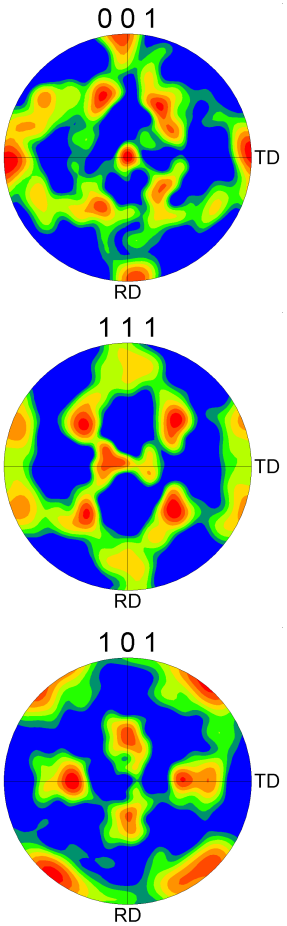
≈2 mm x 1 mm – pas de 2 µm



Orientation

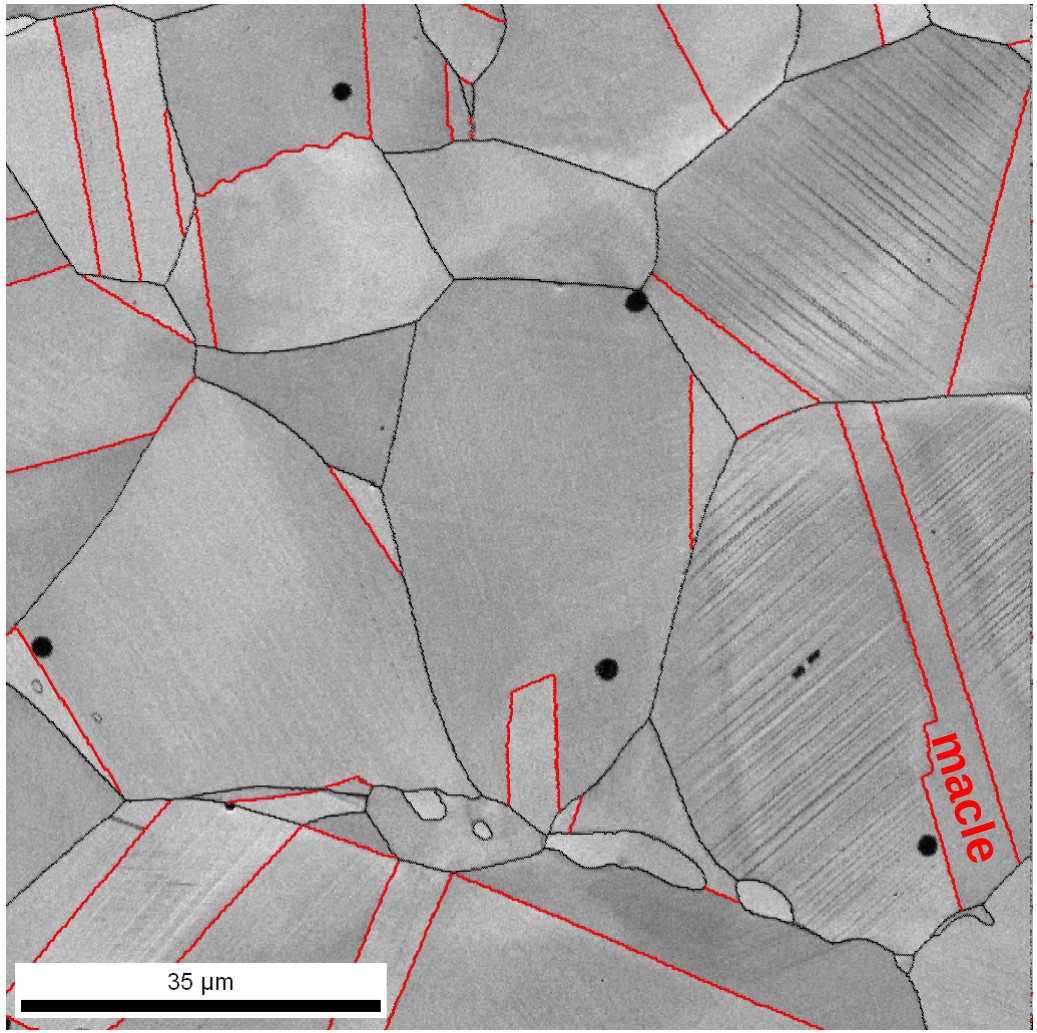
Normal to the surface **ND**





Evolution of the surface crystallographic texture

Acier inoxydable 316L (après traction)



Facteur de qualité IQ

CSL : joints de grains « spéciaux »

Une fraction d'atomes au niveau du joint est commune aux réseaux cristallins de chaque grain

Le choix

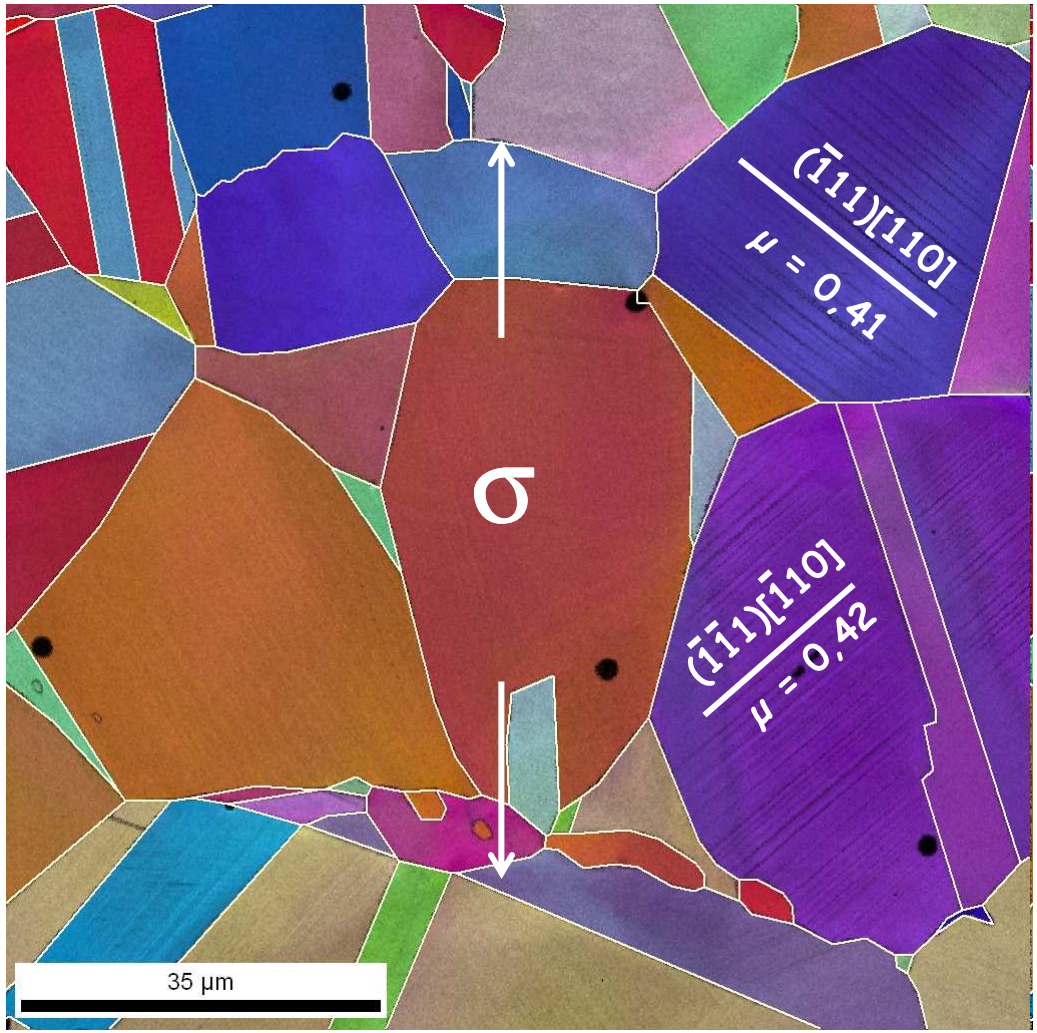
Σ Type	Angle	Axis
1	0	1 1 1
3	60	1 1 1
5	36.86	1 0 0
7	38.21	1 1 1
9	38.94	1 1 0
11	50.47	1 1 0
13a	22.62	1 0 0
13b	27.79	1 1 1
15	48.19	2 1 0
17a	28.07	1 0 0
17b	61.92	2 2 1
19a	26.53	1 1 0
19b	46.83	1 1 1
21a	21.78	1 1 1
21b	44.41	2 1 1

19b
21a
21b

Combine a,b,c..

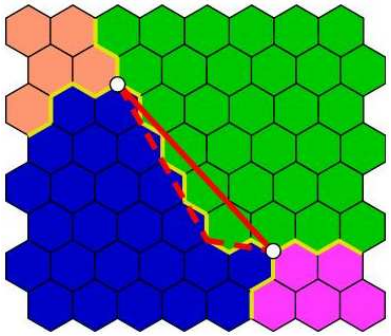
$\Sigma = 3$: macles dans les cfc

Acier inoxydable 316L (après traction)

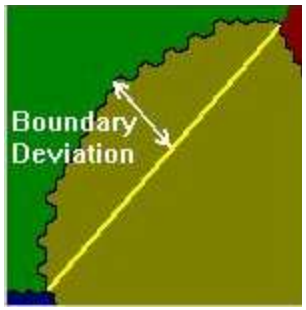


Reconstruction de joints de grains

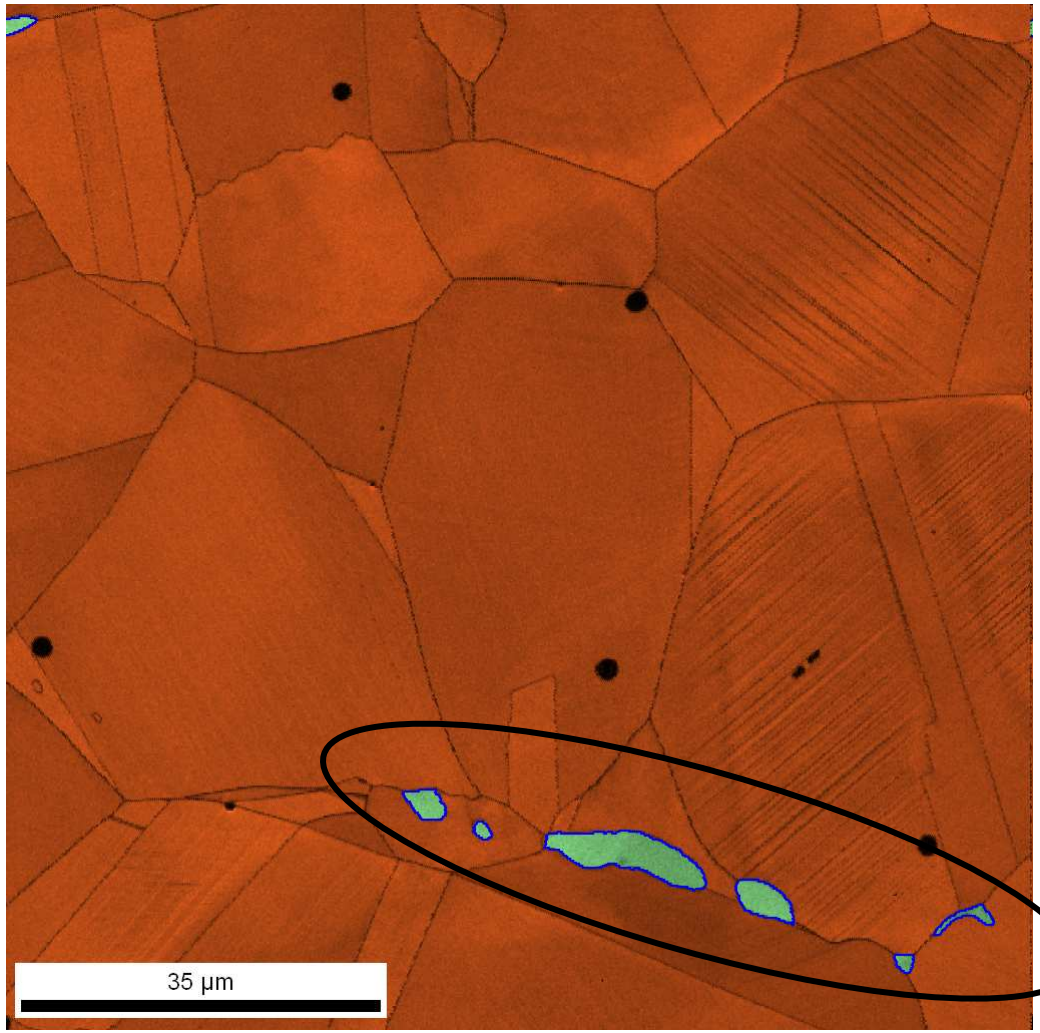
Les joints sont reconstruits par segments de droites



Paramètre :
« boundary deviation (°) »



Acier inoxydable 316L (après traction)



Facteur de qualité IQ + Phases

Joints entre phases

Exemple :

présence de résidus de ferrite

austénite

ferrite