

Measurement Report

H measurement by ERDA

R. Myhill

09/02/2015

18/03/2015

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1 EXPERIMENTAL CONDITIONS

1.1 participants

Bob MYHILL (15/02/2015)

Nicki SIERCH (15/02/2015)

Hélène BUREAU (15/02/2015, 18/03/2015)

1.2 Beam

α , 3 MeV

$H*V=3*3 \mu\text{m}^2$, $B=4979$ Gauss

1.3 X detector

Brucker-15°C

Maximal distance

Filter: mylar 50 μm

V1 A1 ADC1 CG/FG 100/7.80

1.4 Annular detector

ORTEC 1500 μm , +175 V, n° 40218c

Collimator f, reduced ($\sim 1/2$)

Distance: $d=35$ mm

V2, A2, ADC2 CG/FG 100/7.00

1.5 ERDA detector

1000 μm , +175 V

Collimator $\phi=6.25$ mm

Filter: Al 15,0 μm

Distance: $d=50$ mm

V3, A3, ADC3 CG/FG: 200/7.42

1.6 Deflectors

3.69 V

$F=2022$ Hz

2 ACQUISITION

Table 1: acquisition parameters 09/02/2015

run	Q mes	I	RT	LT	scan			
	μc	pA	s	s	H * V	step H * V	pts H * V	f
					$\mu\text{m}*\mu\text{m}$	$\mu\text{m}*\mu\text{m}$	Pts*pts	Hz
Al ₂ O ₃	0,7876	900	870	856	250*250	2*2	126*126	2022
CaCO ₃	1,0888	900	1132	1110	250*250	2*2	126*126	2022
AF ₂ S ₂	0,8244	900	901	875	250*250	2*2	126*126	2022
SiO ₂	0,8548	900	900	888	250*250	2*2	126*126	2022
SnBi	0,2015	300	639	613	250*250	2*2	126*126	2022
AZr	0,1906	300	609	589	250*250	2*2	126*126	2022
Akapton_0	0,6537	600	1067	1057	250*250	2*2	126*126	2022
Akapton_75		600	3601	3534	250*250	2*2	126*126	2022
AZrH_0	0,2367	600	605	586	250*250	2*2	126*126	2022
AZrH_75		600	1000	966	250*250	2*2	126*126	2022

run	Scan prop	I	RT	LT	scan		
	%	pA	s	s	H * V	step H * V	pts H * V
					$\mu\text{m}*\mu\text{m}$	$\mu\text{m}*\mu\text{m}$	Pts*pts
H4095a1		600	2448	2422	100*200	2*2	51*101
H4095a2		600	1184	1170	74*150	2*2	38*76
H4095a2a		600	1456	1438	74*150	2*2	38*76
H4095b1		600	3638	3600	80*400	2*2	41*201
H4148a1		600	4245	4200	80*200	2*2	41*101
H4148a2		600	3648	3600	100*200	2*2	51*101
H4148b1		600	3927	3884	50*200	2*2	26*101
H4113a1a		600	4860	4800	60*400	2*2	31*201
H4113a2		600	4214	4162	60*300	2*2	31*151

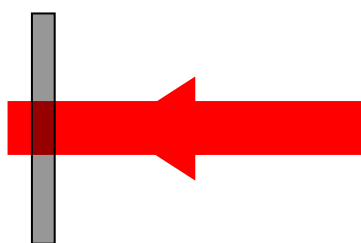
Table 2: acquisition parameters 18/03/2015

run	Q mes	I	RT	LT	scan			
	µc	pA	s	s	H * V	step H * V	pts H * V	f
					µm*µm	µm*µm	Pts*pts	Hz
Al2O3					250*250	2*2	126*126	2022
CaCO3	0,655	950	656	644	250*250	2*2	126*126	2022
AFes2	0,783	850	889	865	250*250	2*2	126*126	2022
SiO2	0,7903	950	840	829	250*250	2*2	126*126	2022
SnBi	0,1884	200	927	895	250*250	2*2	126*126	2022
AZr	0,1245	200	598	583	250*250	2*2	126*126	2022
Akapton_0	1,007	600	1700	1685	250*250	2*2	126*126	2022
Akapton_75		600	3613	3561	250*250	2*2	126*126	2022
AZrH_0	0,1901	350	604	585	250*250	2*2	126*126	2022
AZrH_75		350	609	591	250*250	2*2	126*126	2022

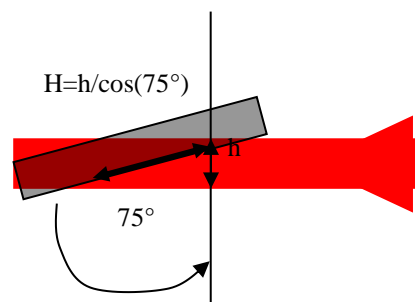
run	Scan prop	I	RT	LT	scan		
	%	pA	s	s	H * V	step H * V	pts H * V
					µm*µm	µm*µm	Pts*pts
S6239A		600	4026	3943	100*200	2*2	51*101
S6239B		600	3581	3532	100*200	2*2	51*101
RK3		600	7200	7108	100*200	2*2	51*101
H4113B		600	4569	4525	100*200	2*2	51*101
H4094A		600	6000	5916	100*200	2*2	51*101
H4094B		600	6000	5886	100*200	2*2	51*101
S6292B		600	4499	4376	200*120	2*2	101*61
S6292A1		600	5030	4946	100*300	2*2	51*151
S6292A2		600	4400	4350	100*300	2*2	51*151
S6278B		600	5576	5509	70*200	2*2	36*101
S6278A1		600	3780	3731	70*200	2*2	36*101

Table 3: scan size on the sample

Acquisition file	H size	H size	V size	nb of pts
	normal	tilted		H*V
	μm	μm	μm	
ref samples	250	966	250	126*126
H4095a1	100	386	200	100*200
H4095a2	74	286	150	74*150
H4095a2a	74	286	150	74*150
H4095b1	80	309	400	80*400
H4148a1	80	309	200	80*200
H4148a2	100	386	200	100*200
H4148b1	50	193	200	50*200
H4113a1a	60	232	400	60*400
H4113a2	60	232	300	60*300
S6239A	100	386	200	51*101
S6239B	100	386	200	51*101
RK3	100	386	200	51*101
H4113B	100	386	200	51*101
H4094A	100	386	200	51*101
H4094B	100	386	200	51*101
S6292B	200	773	120	101*61
S6292A1	100	386	300	51*151
S6292A2	100	386	300	51*151
S6278B	70	270	200	36*101
S6278A1	70	270	200	36*101
scan step	2	8	2	126*126



Normal incidence



On the target, 75°

3 MEASUREMENT

3.1 Solid angle measurement

Table 4: Solid angle calculation

	Ω_{RBS}		Ω_{ERDA}	
	Mean value	Dispersion	Mean value	Dispersion
	mSr	mSr	mSr	mSr
09/02/2015	64.97	4.30	15.20	0.75
18/03/2015	69.50	4.60	13.48	2.58

4 CARTOGRAPHIES OF THE SAMPLES 09/02/2015

4.1 H4095a1

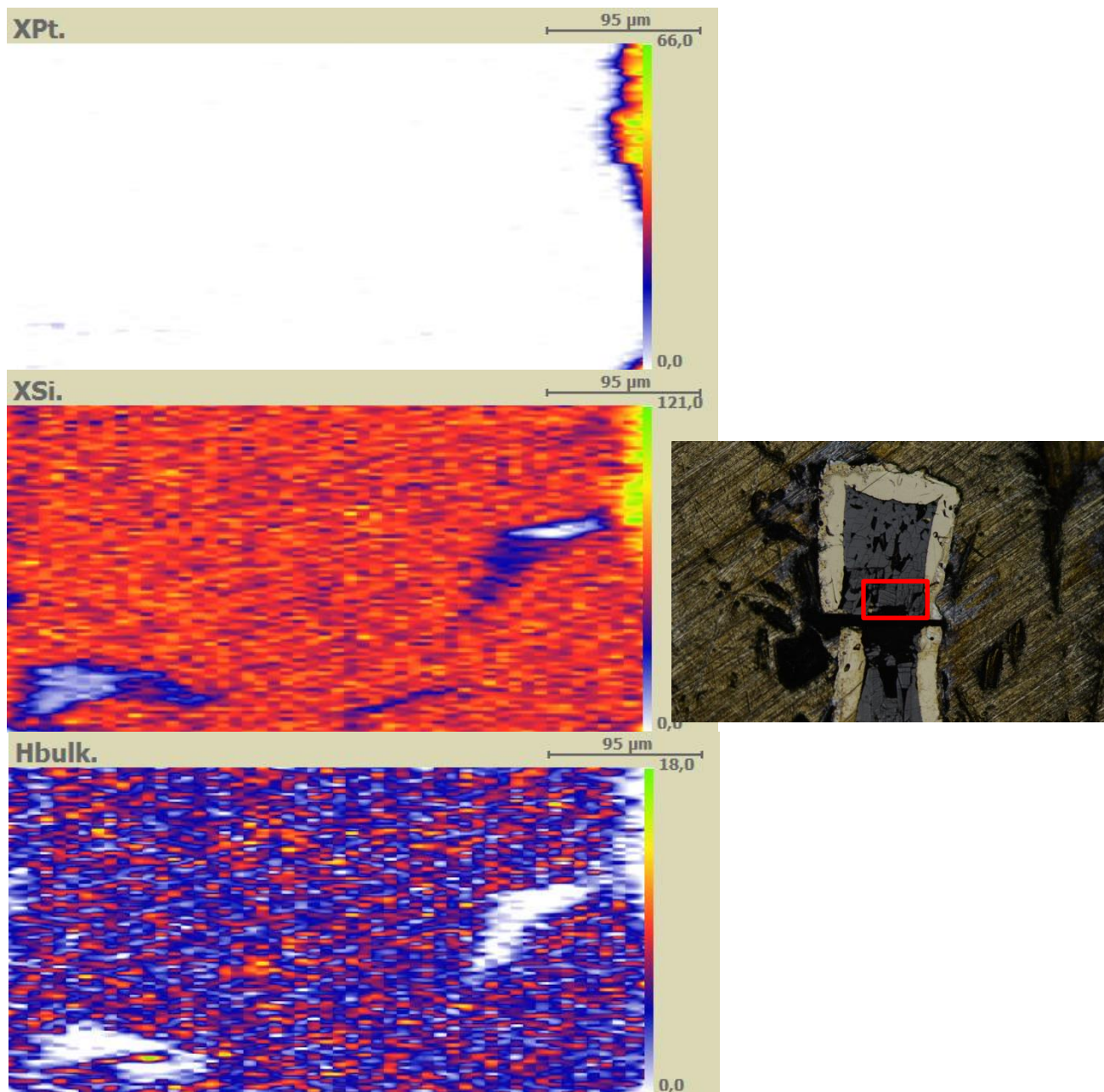


Figure 1 : H4095a1, global scans

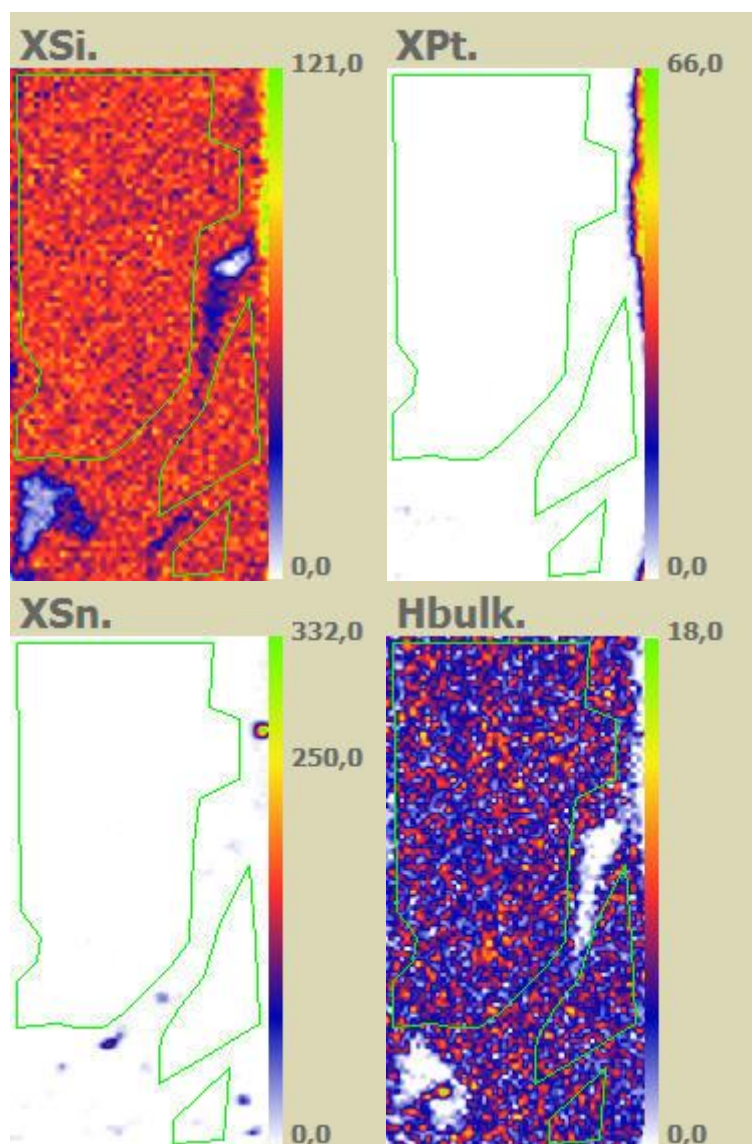


Figure 2 : H4095a1_r1

4.2 H4095a2

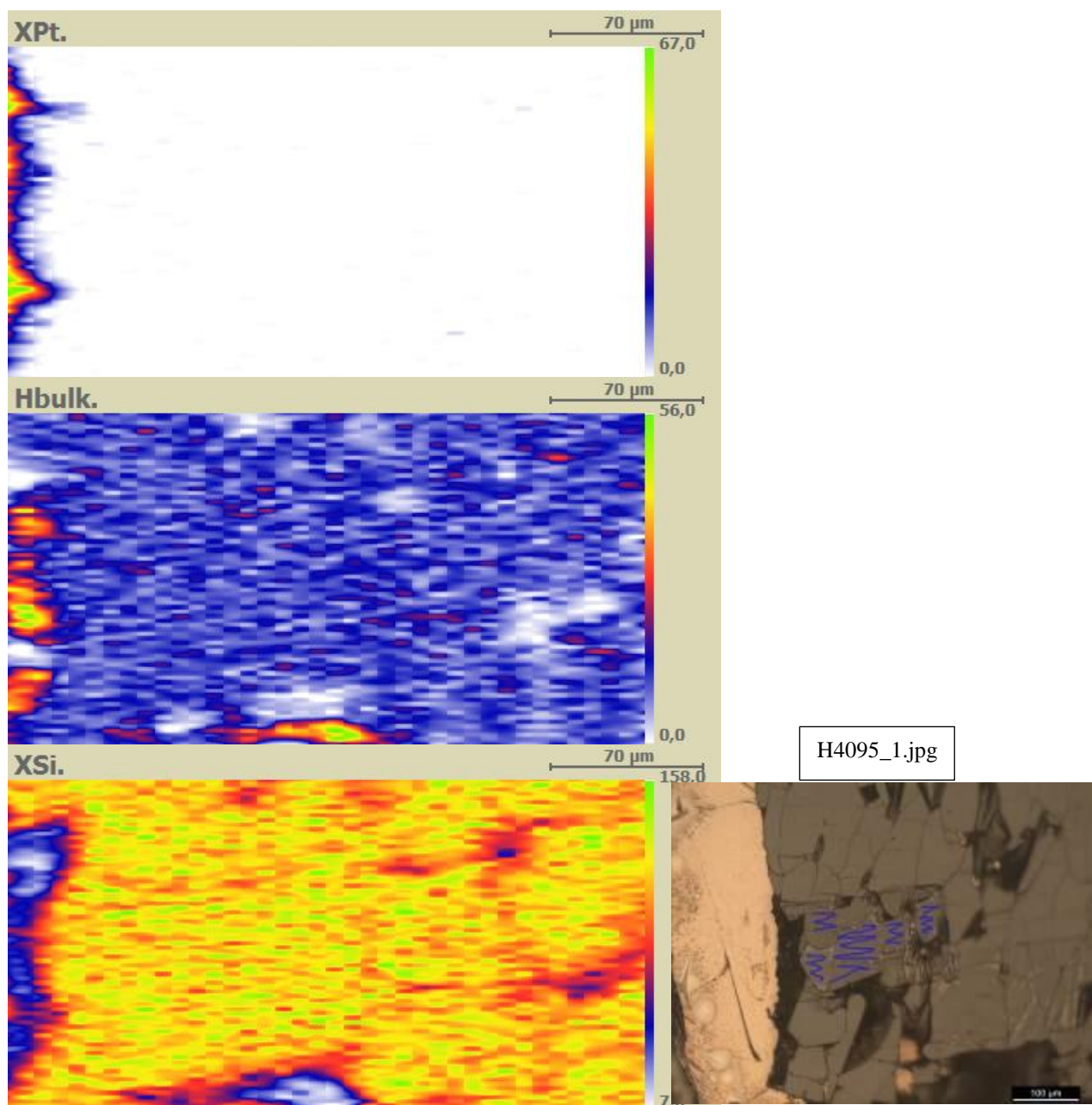


Figure 3: H4095a2, global cartographies

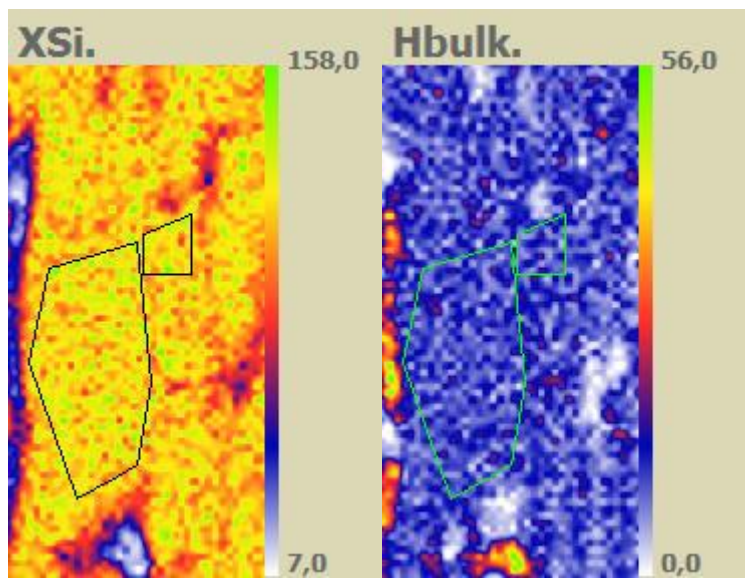


Figure 4: H4095a2_r1, Region of interest

4.3 H4095b1

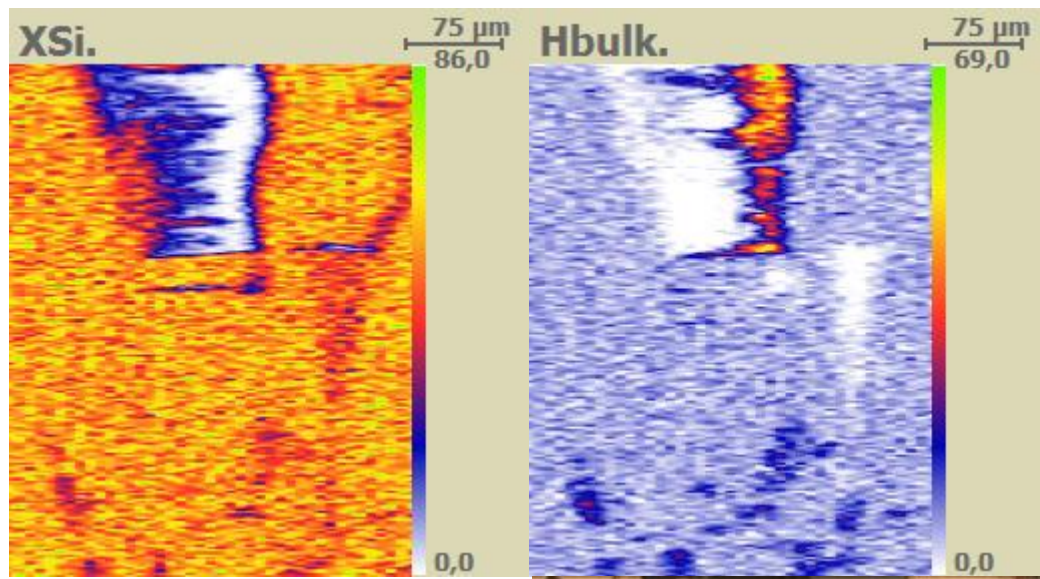


Figure 5 : H4095b1, global scans



H4095_2maybe

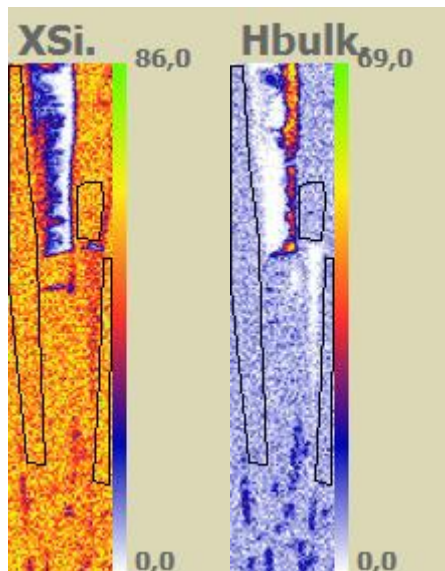


Figure 6 : H4095b1_r1, region of interest

4.4 H4148a1

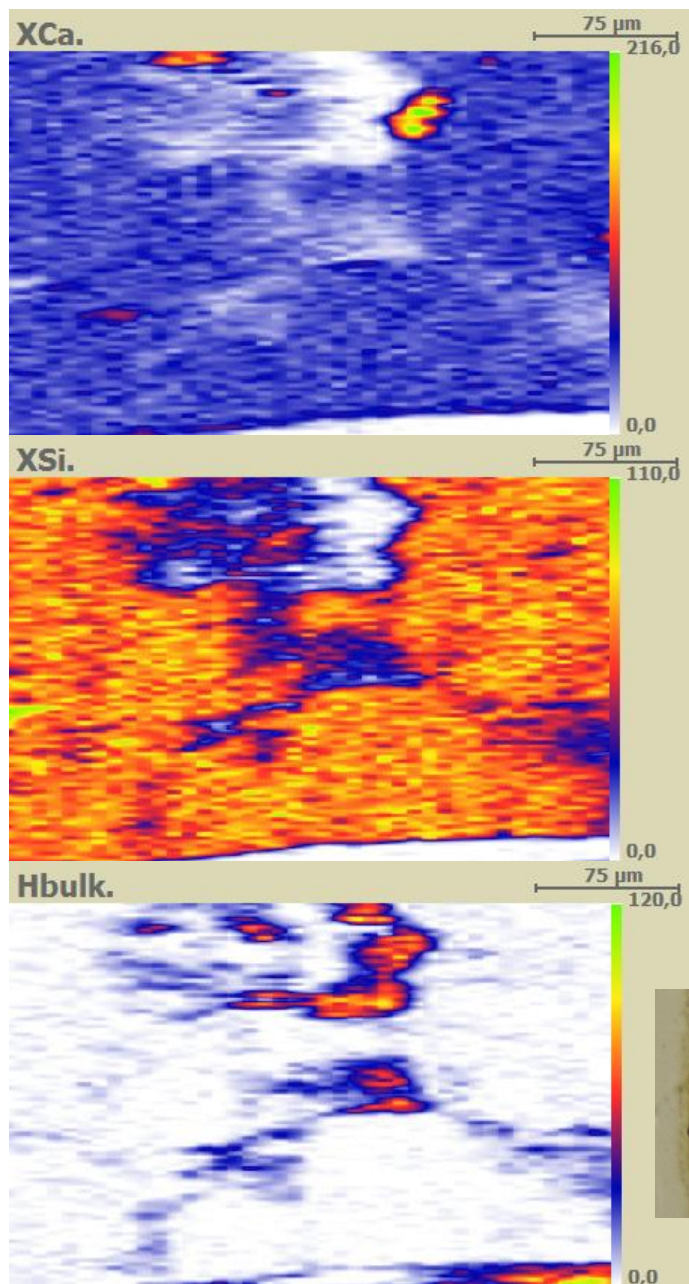


Figure 7 : H4148a1, global scans

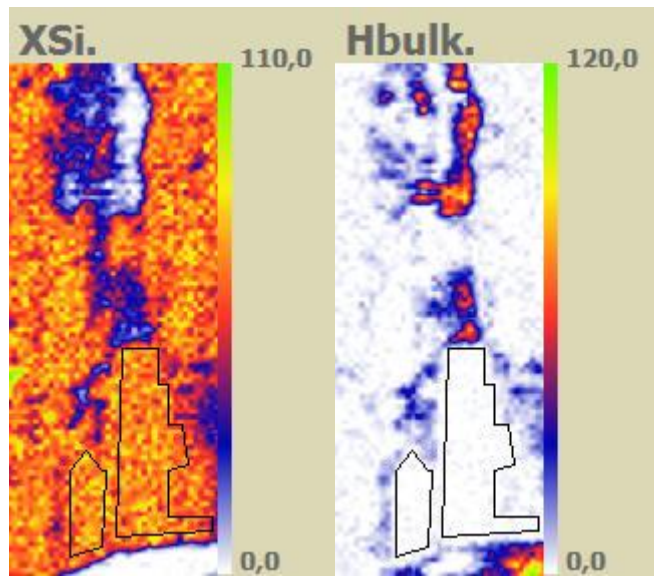


Figure 8 : H4148a1_r1, region of interest

4.5 H4148a2

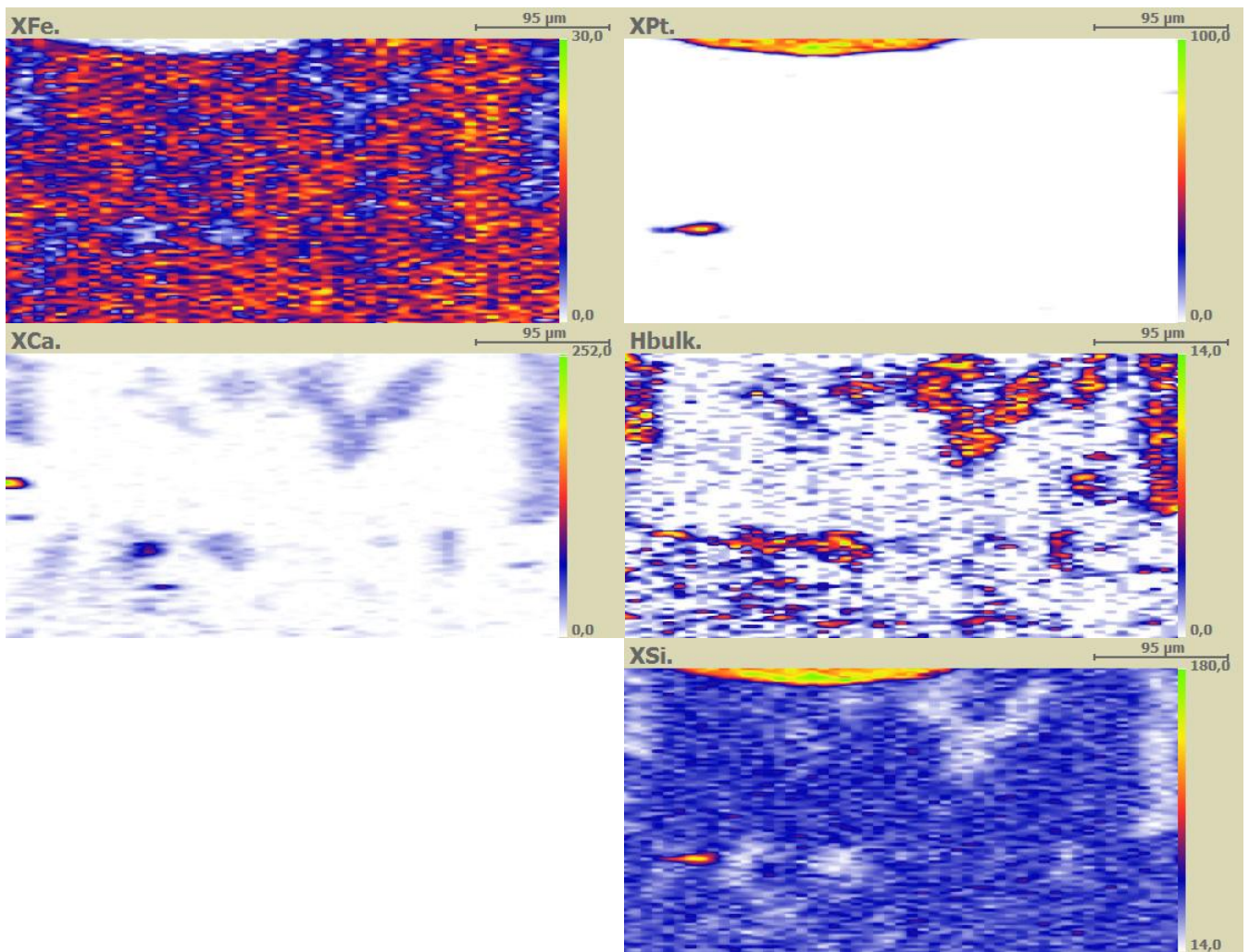
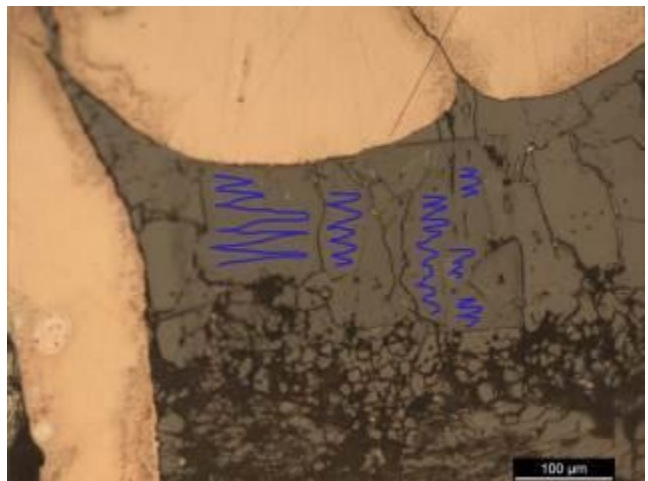


Figure 9 : H4148a2, global scans



H4841_1

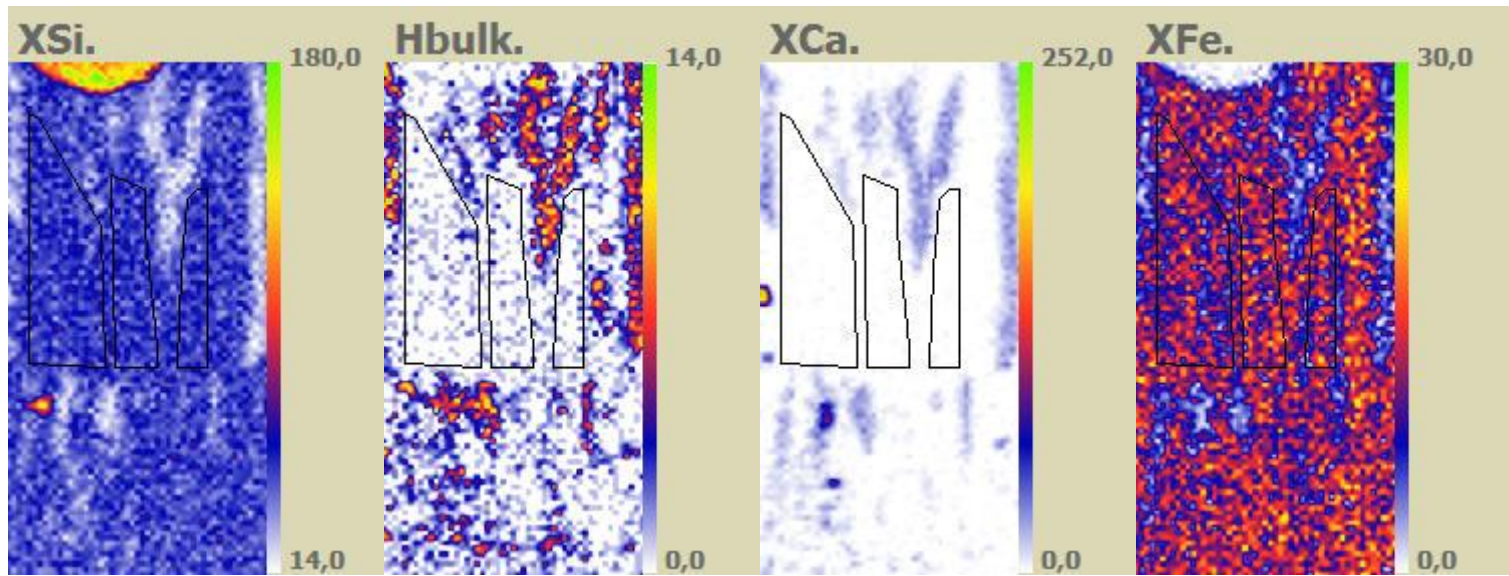


Figure 10 : H4148a2_r1, region of interest

4.6 H4148b1

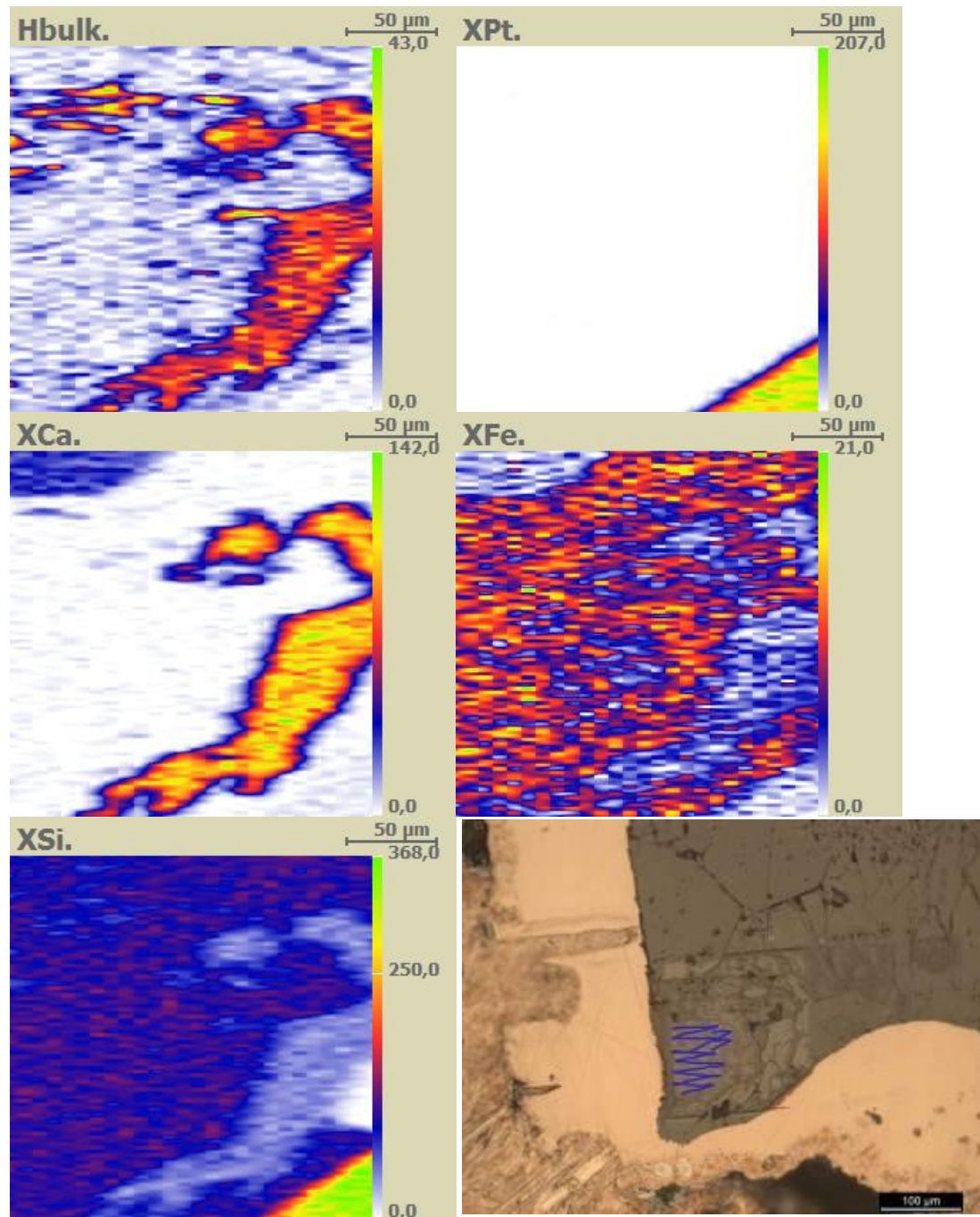


Figure 11 : H4148b1, global scans

H4841_2

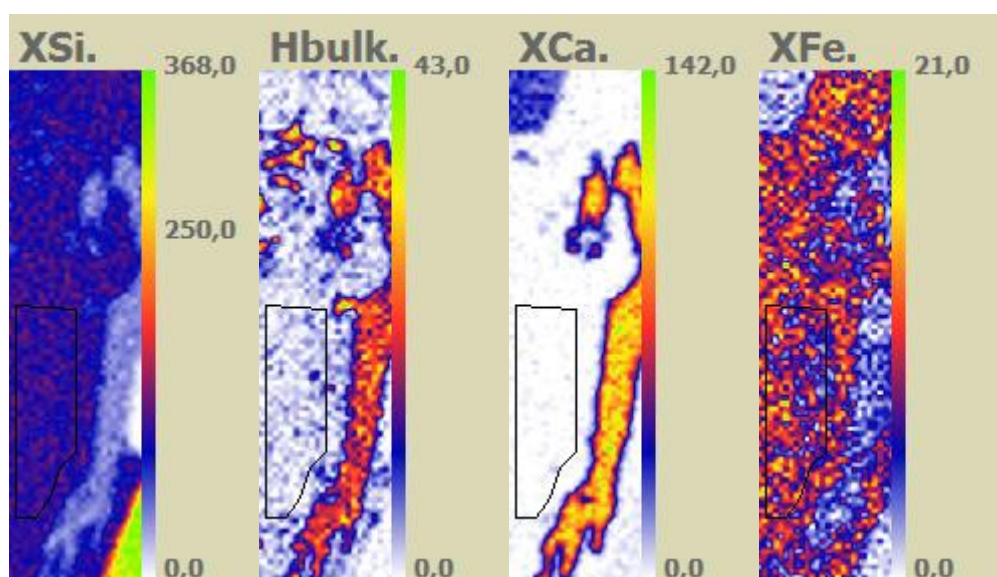


Figure 12 : H4148b1_r1, region of interest

The composition of the phase, as given in the excel file ERDA_2015_average_microprobe, is not corresponding to the RBS spectrum. The global composition is fitted iteratively between RBS and ERDA.

Table 5: Composition, fitted with SIMNRA

	At prop
Na	0.00000
Si	0.17170
Ca	0.00000
Fe	0.01160
Mg	0.17564
Al	0.03158
O	0.60479
H	0.00469

4.7 H4113a1a

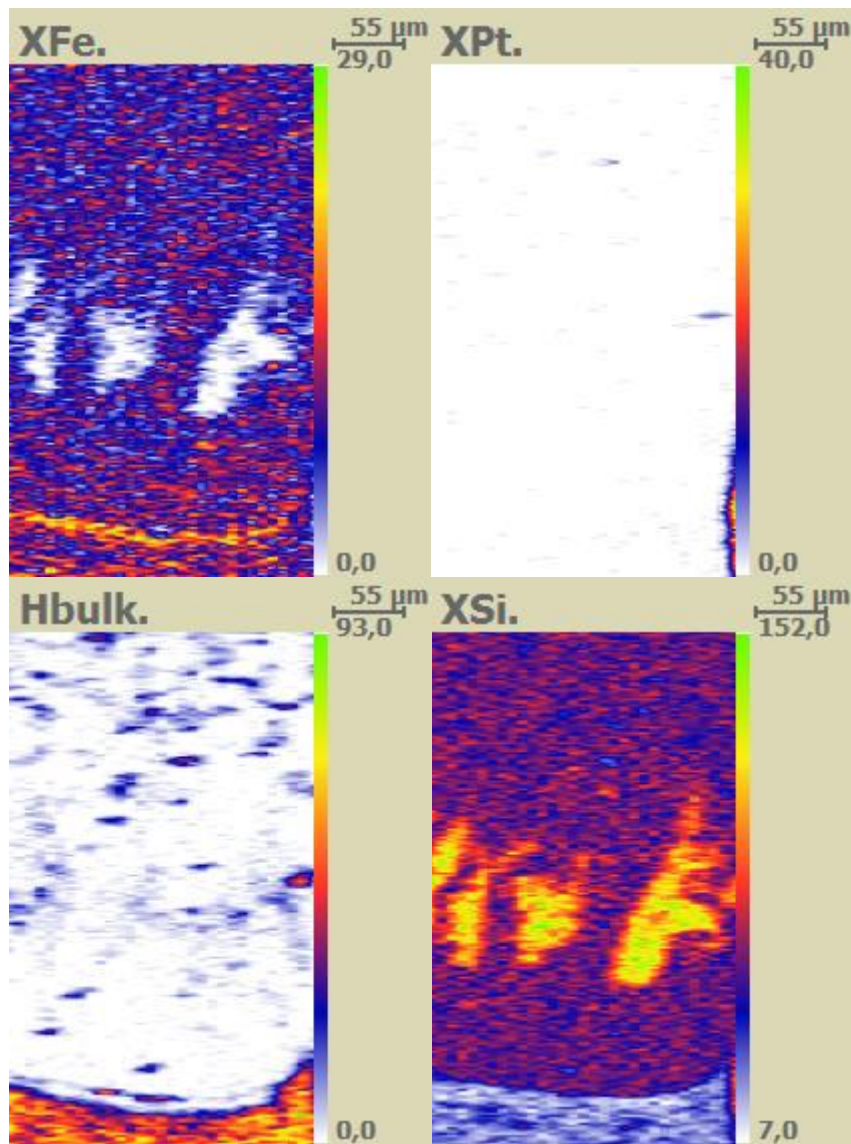
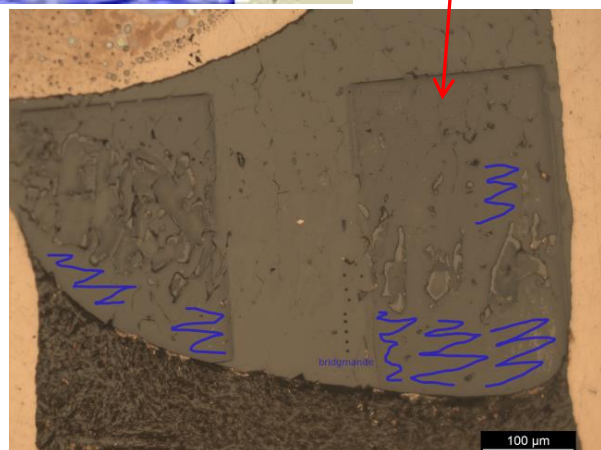


Figure 13 : H4113a1a, global scans



H4113

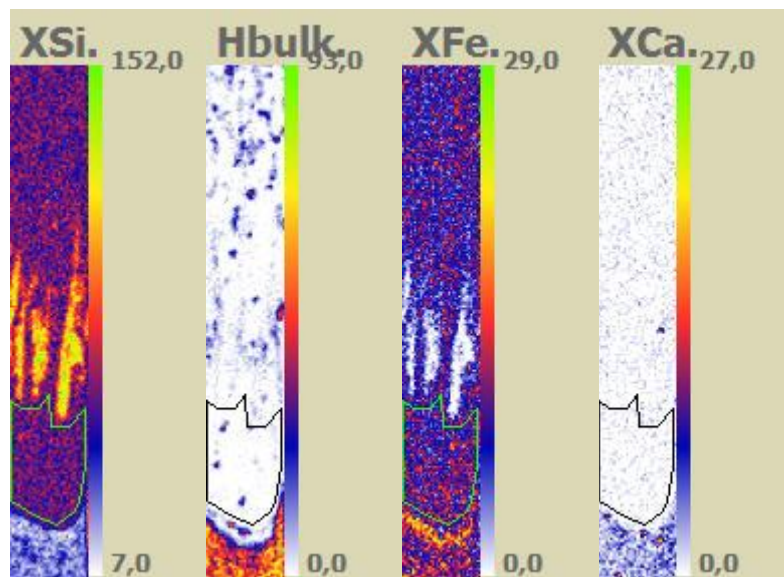


Figure 14: H4113a1a_r1, region of interest

4.8 H4113a2

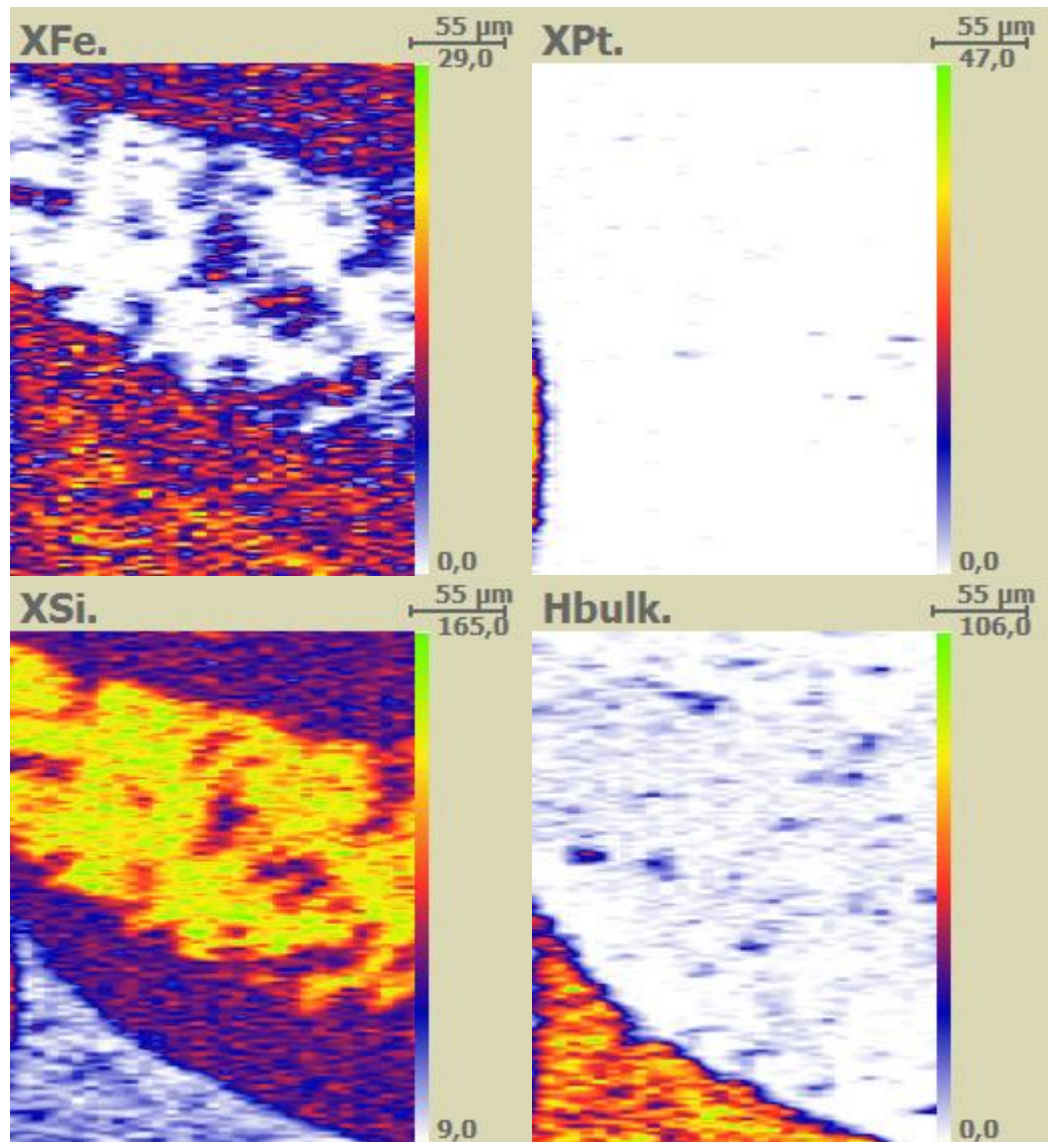
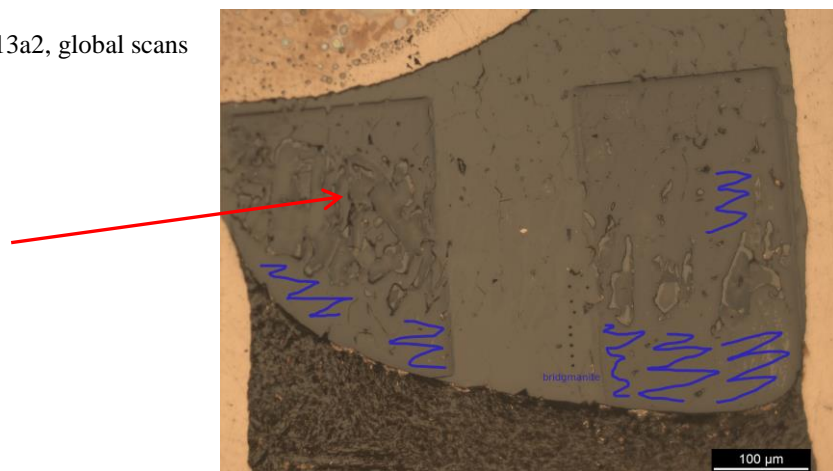


Figure 15 : H4113a2, global scans



H4113

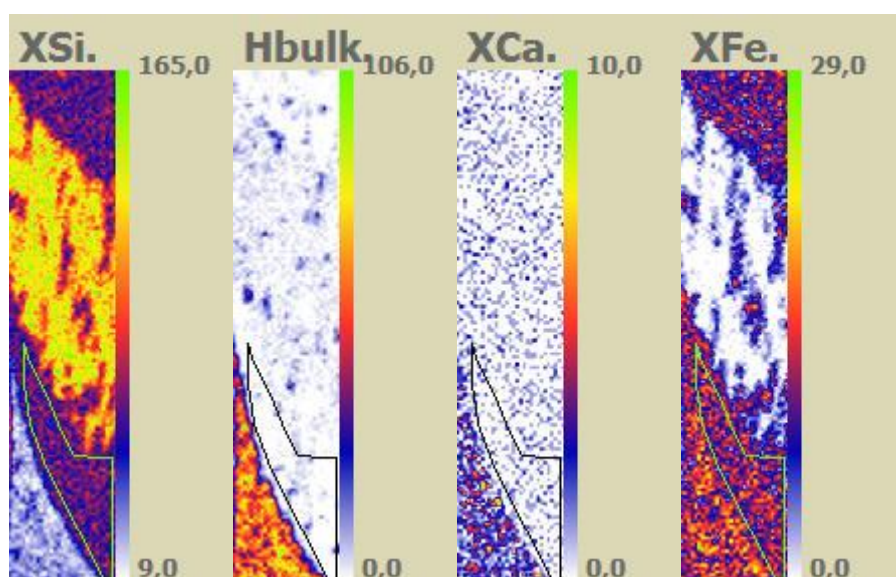


Figure 16 : H4113a2_r1, region of interest

Table 6: Measurement of 09 / 02 / 2015, results

run	phase	Jpg file	Percentage of the total map	[H] At ppm	[H] Wt ppm	[H ₂ O] Wt ppm
H4095a1	stv		63,4	42450	2234	19931
H4095a2	stv	H4095_1	20,9	42400	2231	19906
H4095b1	stv	H4095_2 maybe	27,0	49400	2624	23407
H4148a1	g	?	14,3	3300	162	1444
H4148a2	bdg	H4841_1	22,4	2250	109	971
H4148b1	g	H4841_2	18,8	4690	234	2086
H4113a1	bdg	H4113	19,4	4960	243	2167
H4113a2	bdg	H4113	14,7	7920	389	3472

5 CARTOGRAPHIES OF THE SAMPLES 18/03/2015

5.1 S6239a

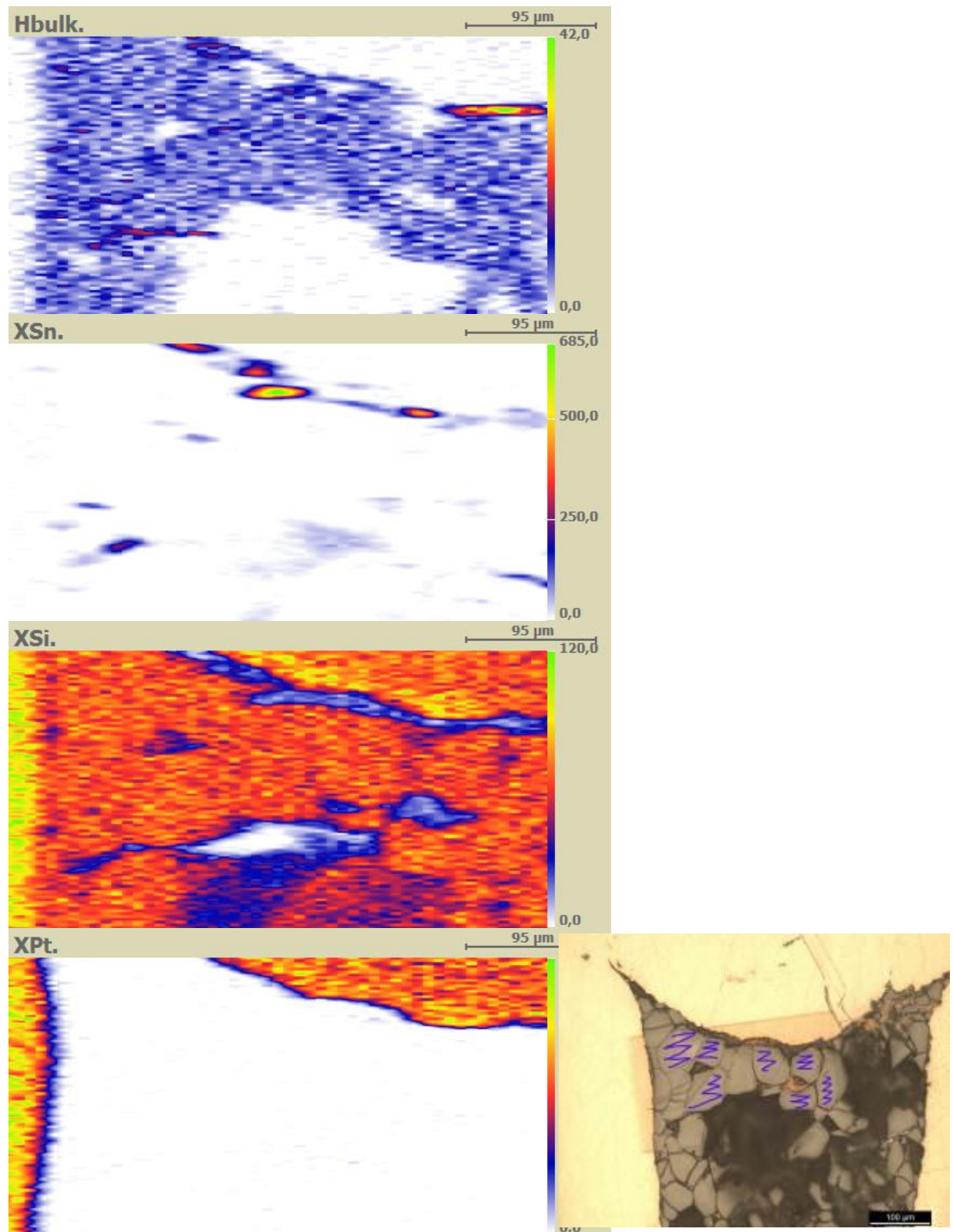


Figure 17 : S6239a, global scans

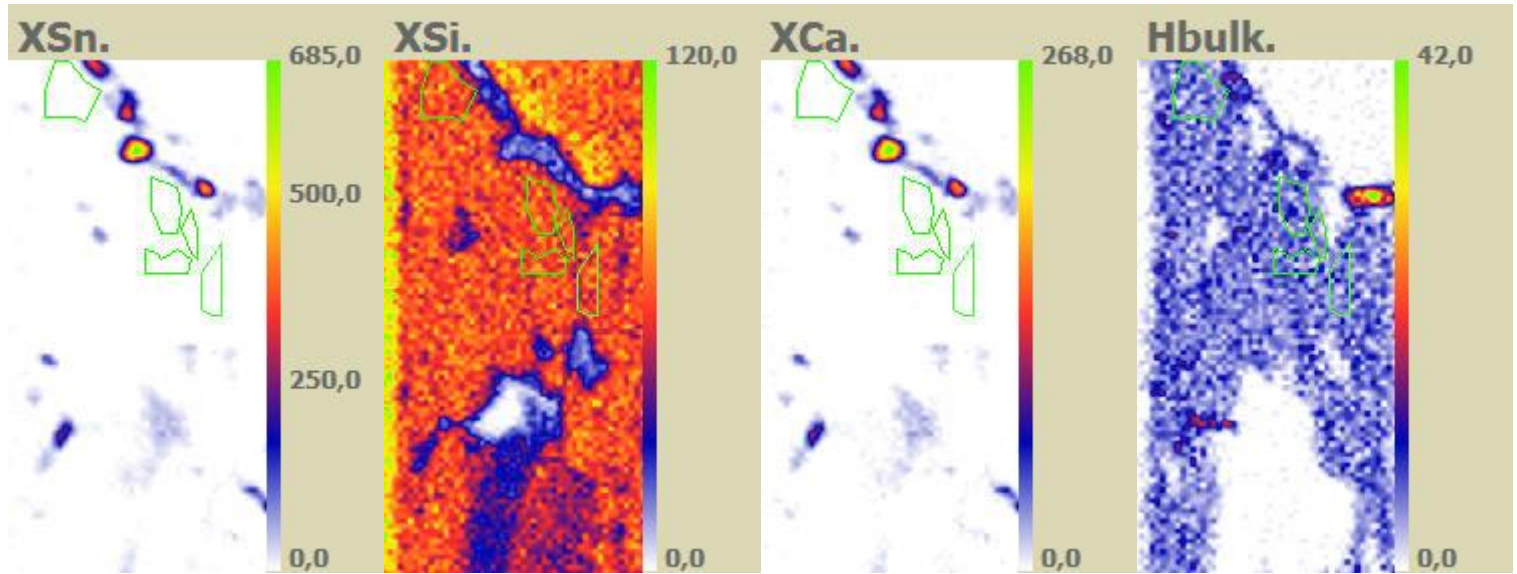


Figure 18: S6239a_r1, region of interest

5.2 S6239b

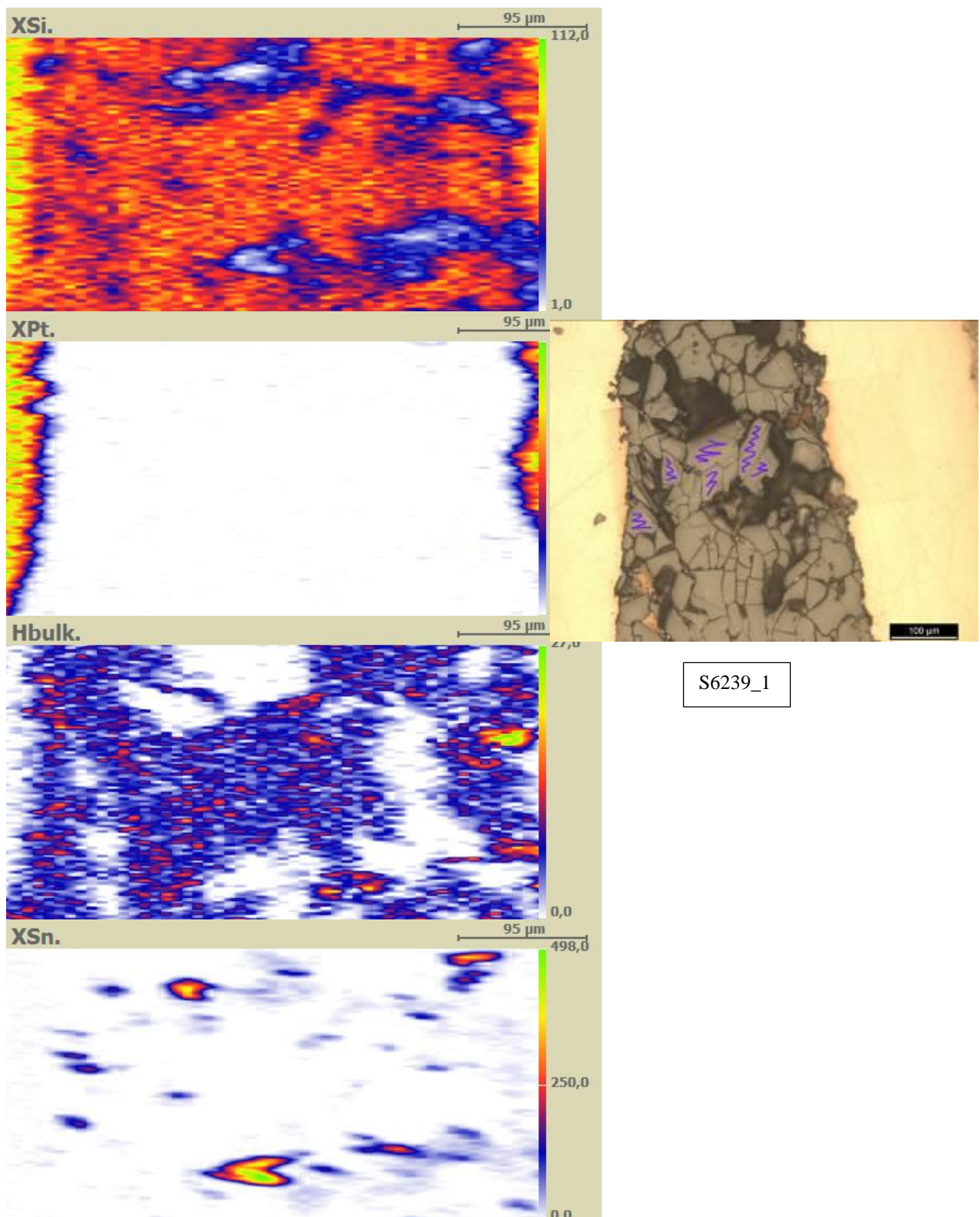


Figure 19 : S6239b, global scans

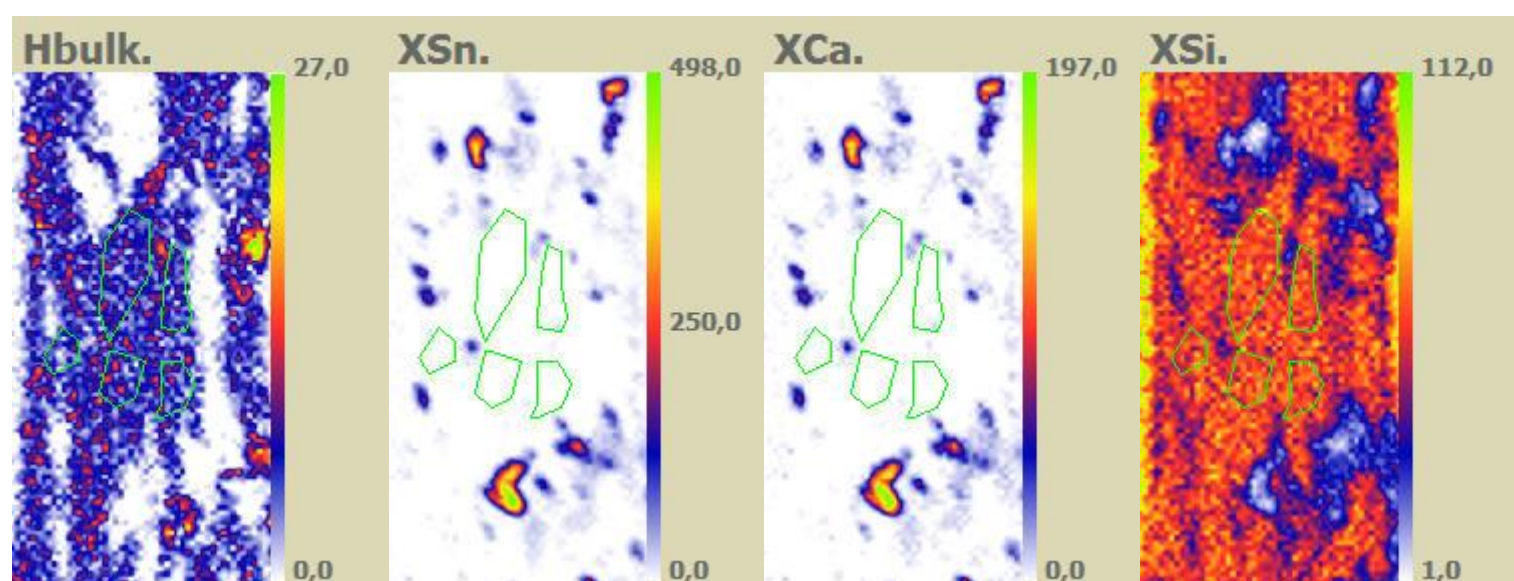


Figure 20: S6239b_r1, region of interest

5.3 **RK3**

RK3

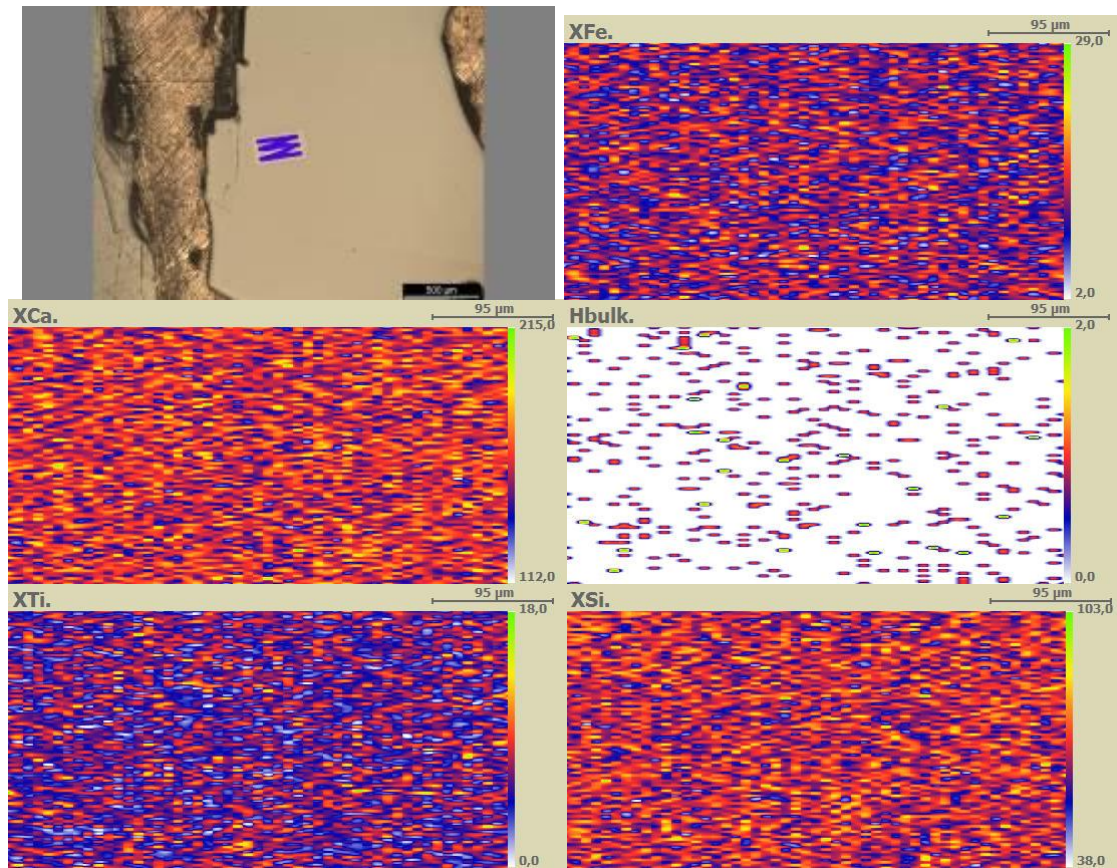


Figure 21 : RK3, global scans

5.4 H4113b

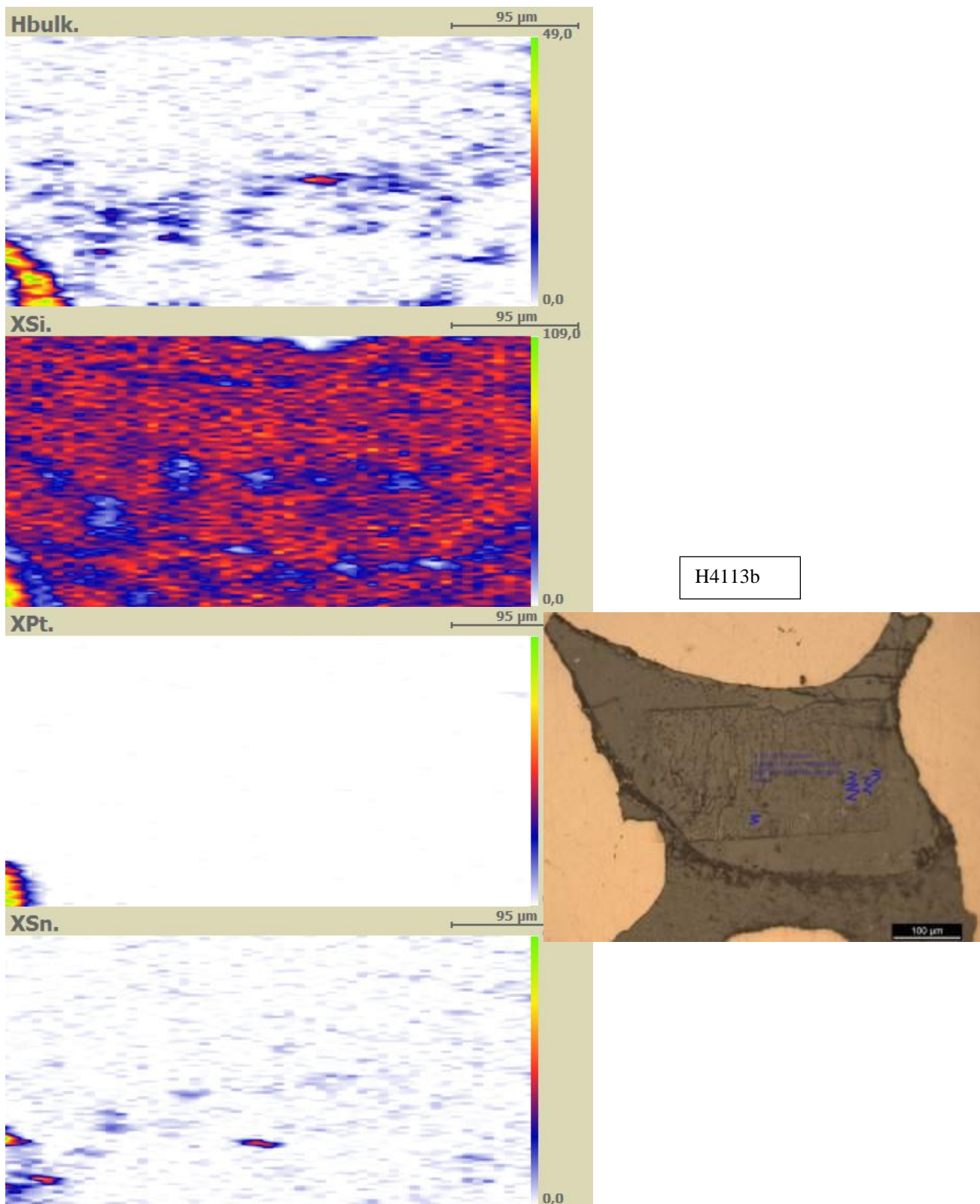
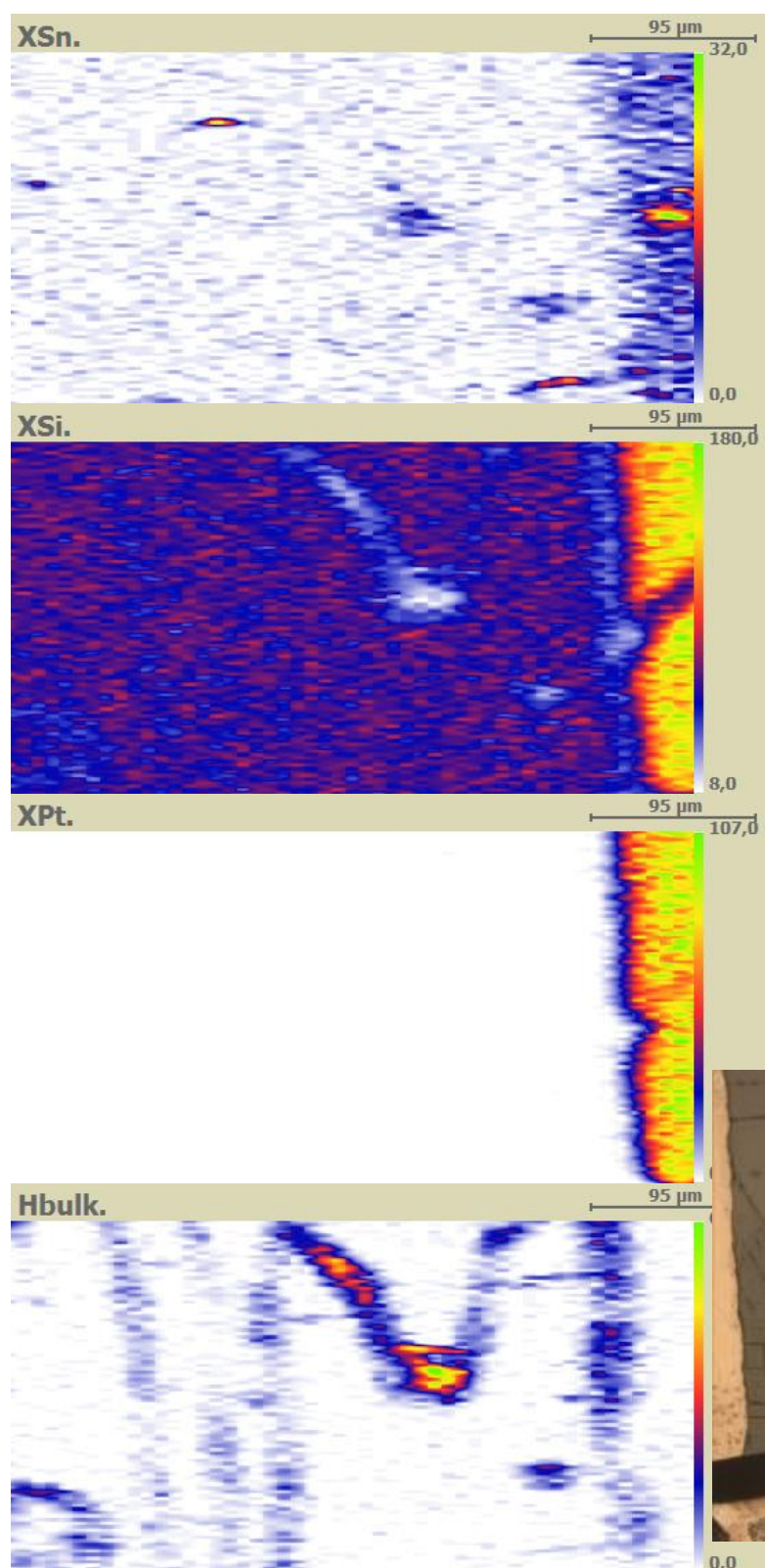


Figure 22 : H4113b, global scans

The statistics are very poor, it's not possible to analyse this sample.

5.5 H4094a



H4094_1b

Figure 23 : H4094a, global scans

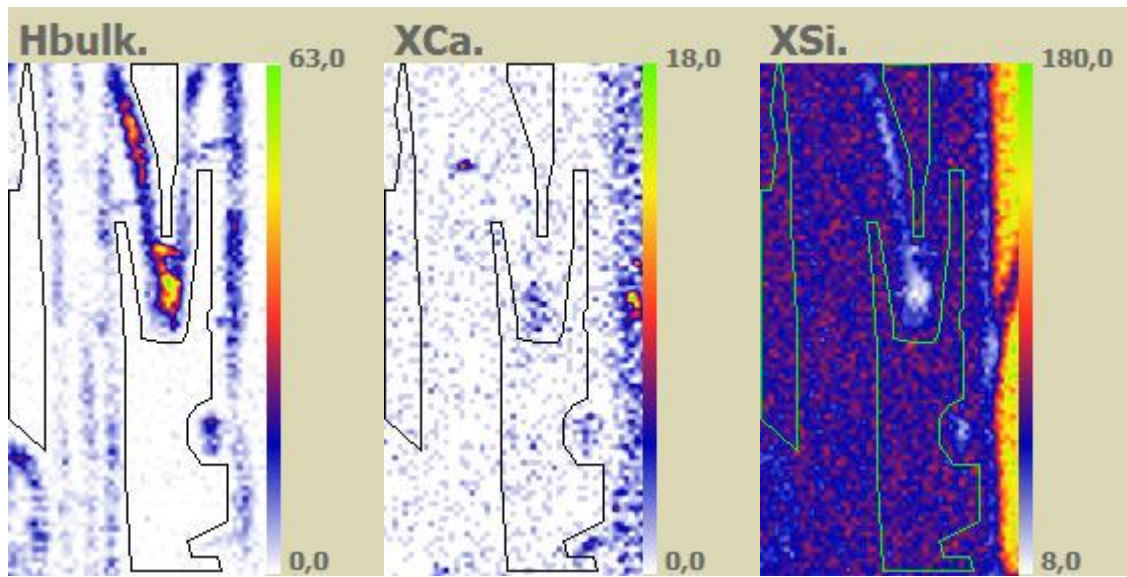


Figure 24 : H4094a_r1, region of interest

5.6 H4094b

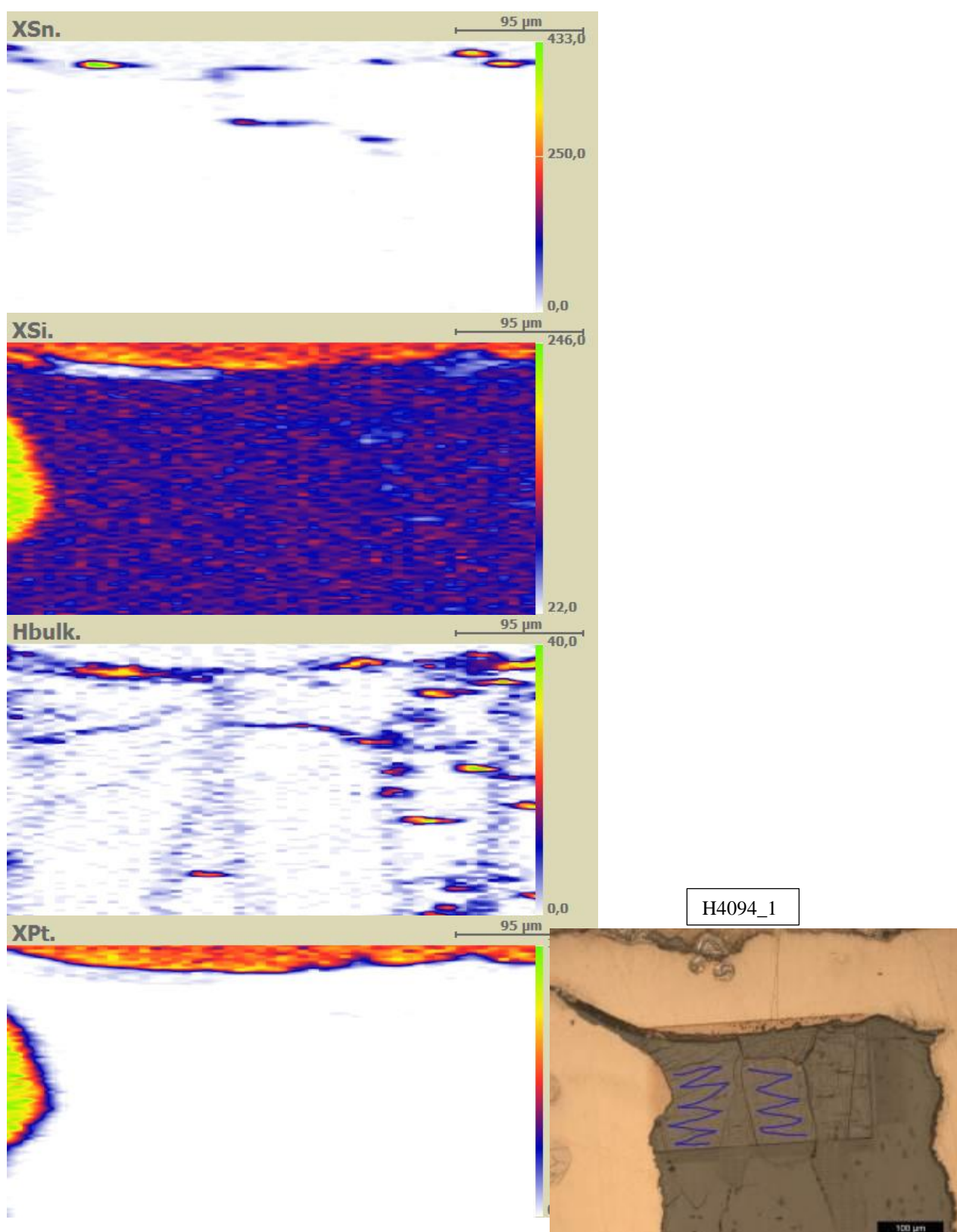


Figure 25 : H4094b, global scans

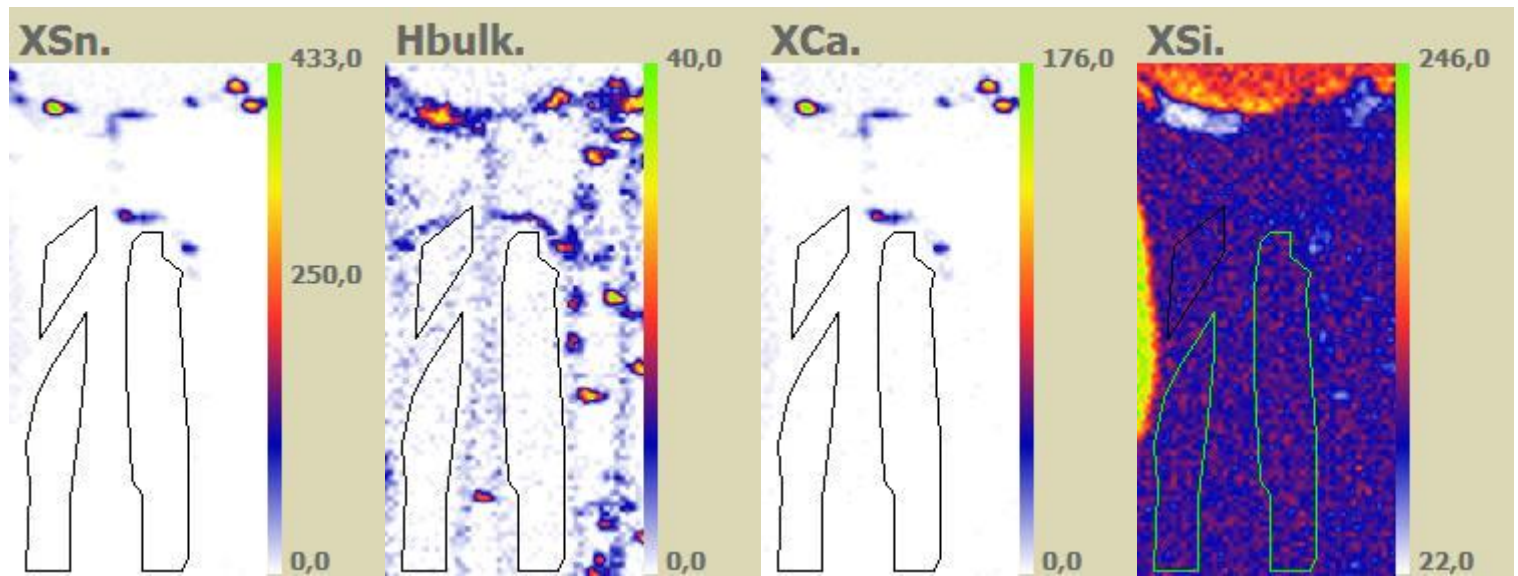


Figure 26 : H4094b_r1, region of interest

The composition of the region of interest has been taken identical to H4094a_r1.

5.7 S6292b

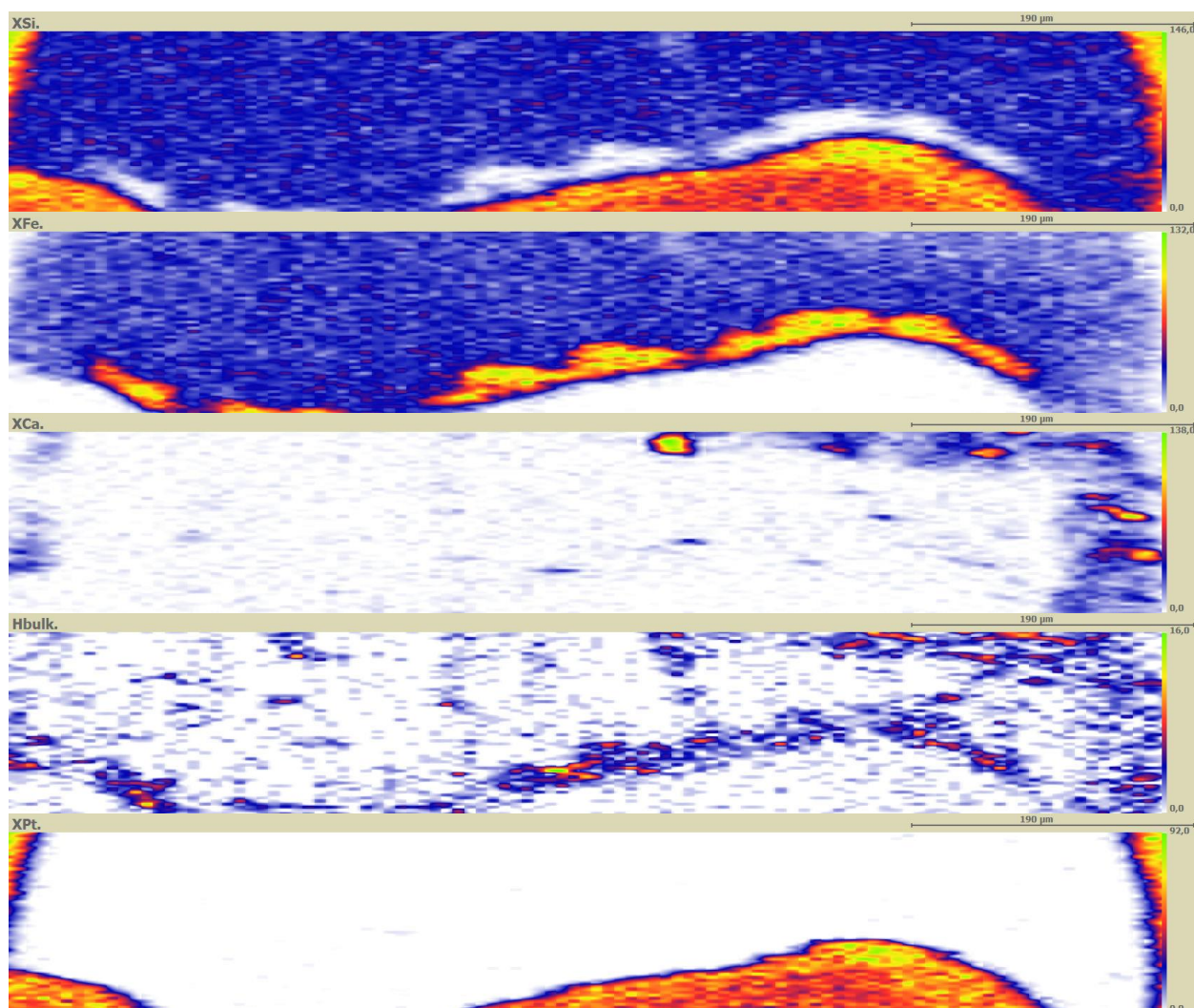
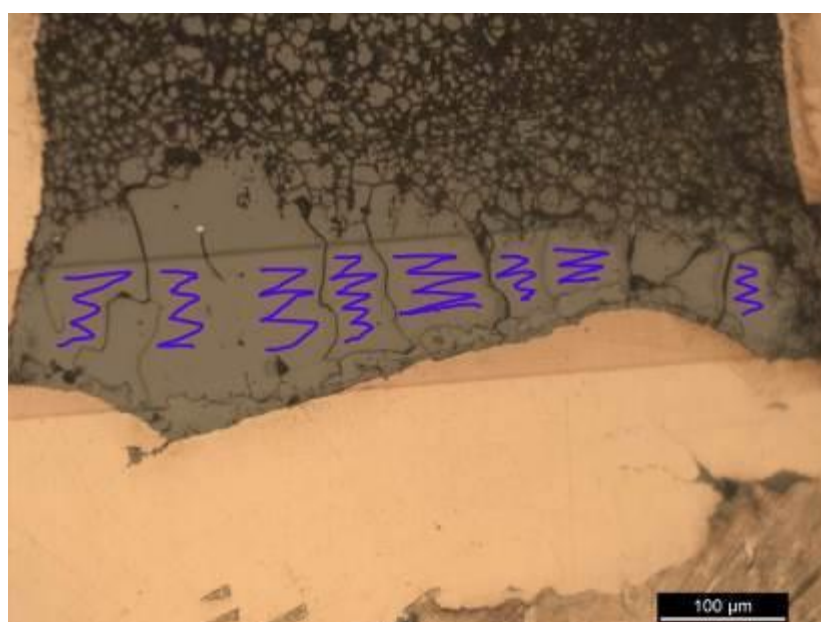


Figure 27 : S6292b, global scans



H626292_2

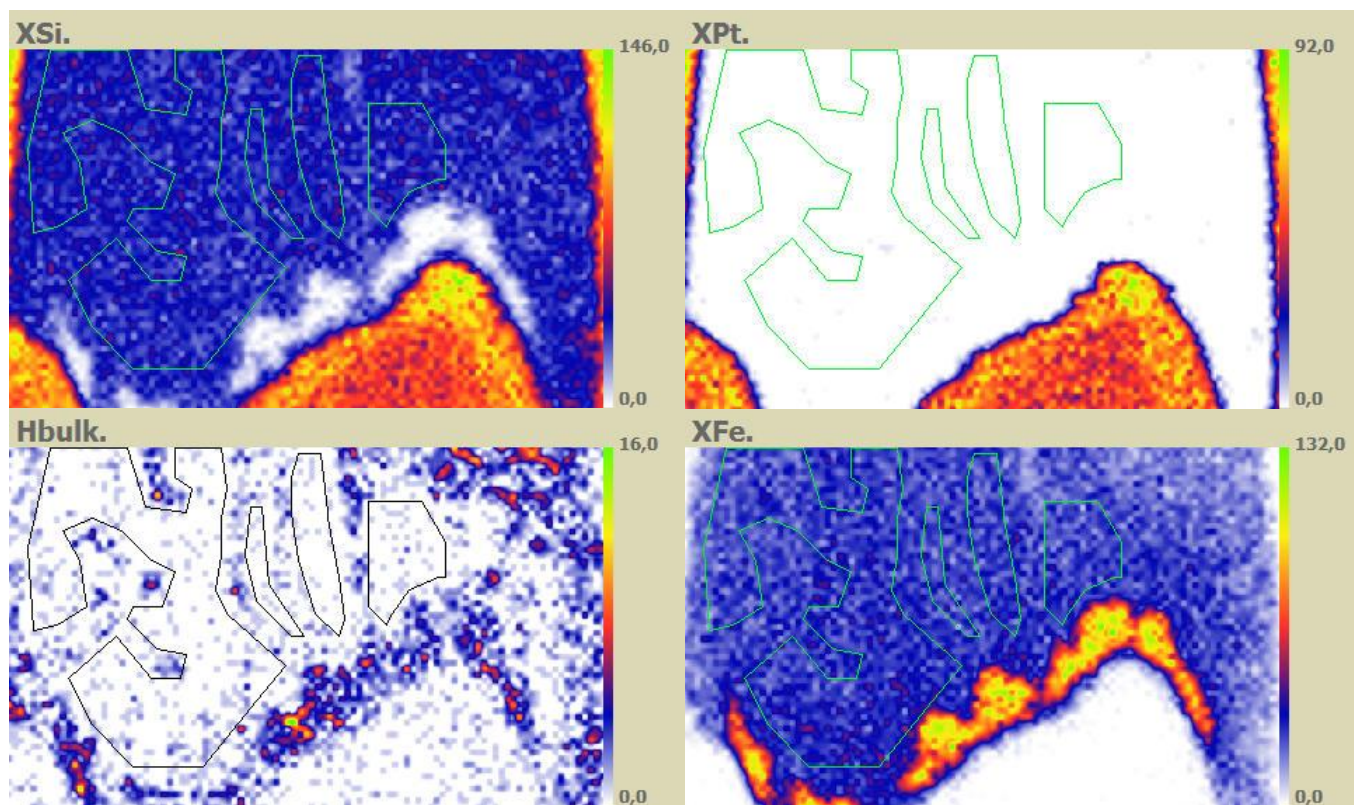


Figure 28: S6292b_r1, region of interest

5.8 S6292a1

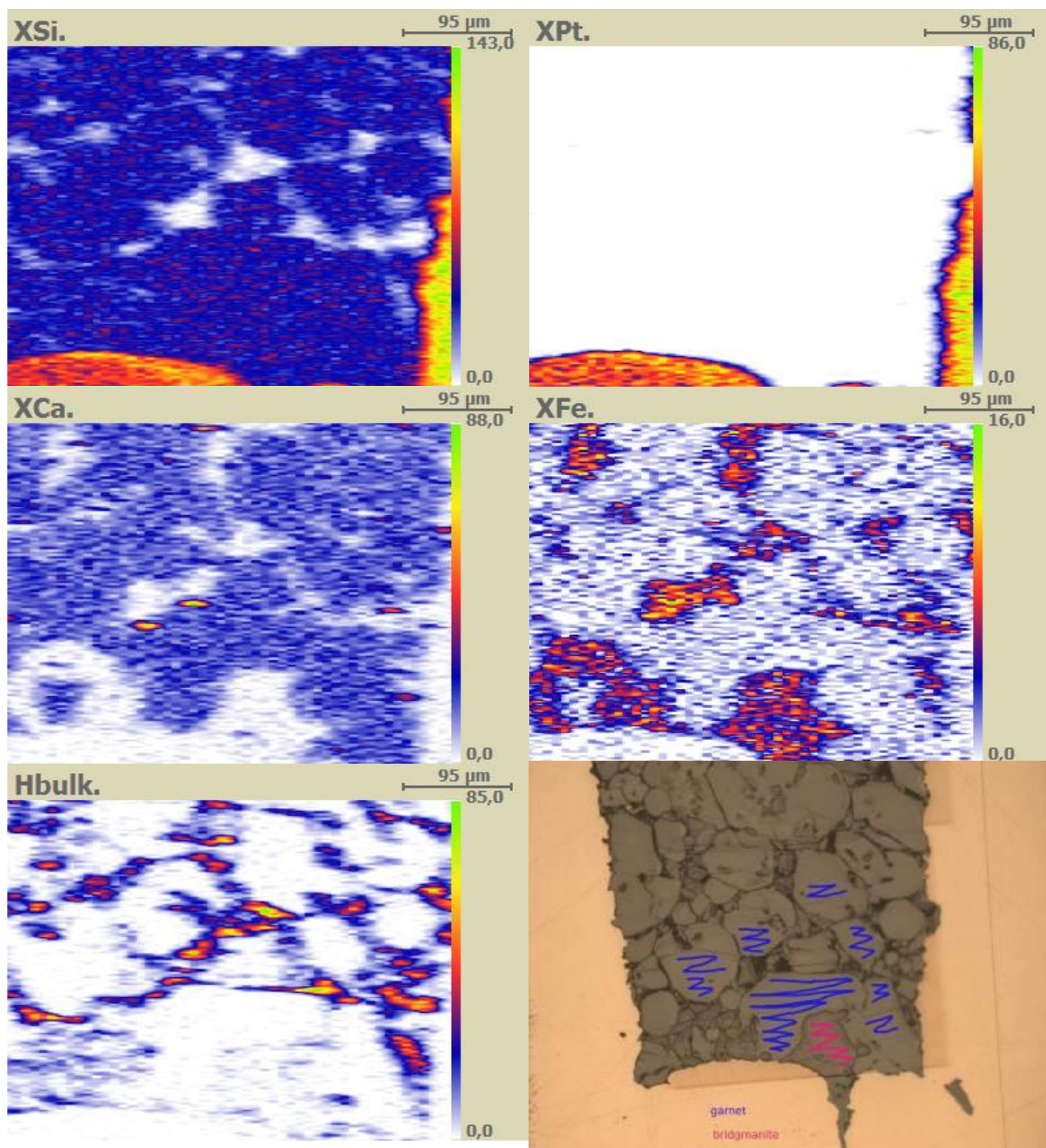


Figure 29 : S6292a1, global scans

H626292_1b

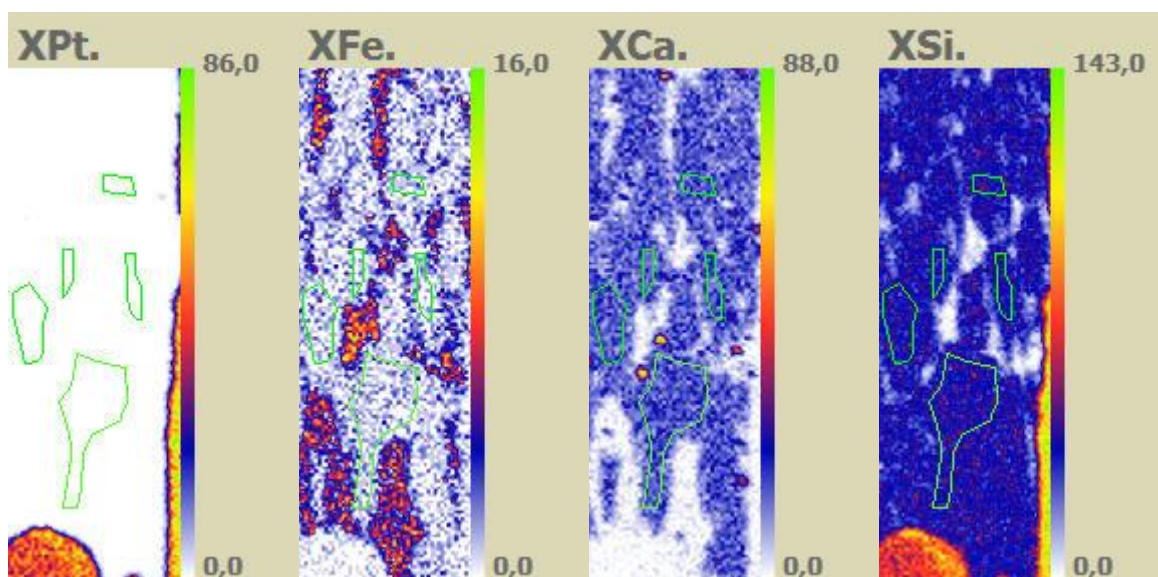


Figure 30 : S6292a1_r1, region of interest

5.9 S6292a2

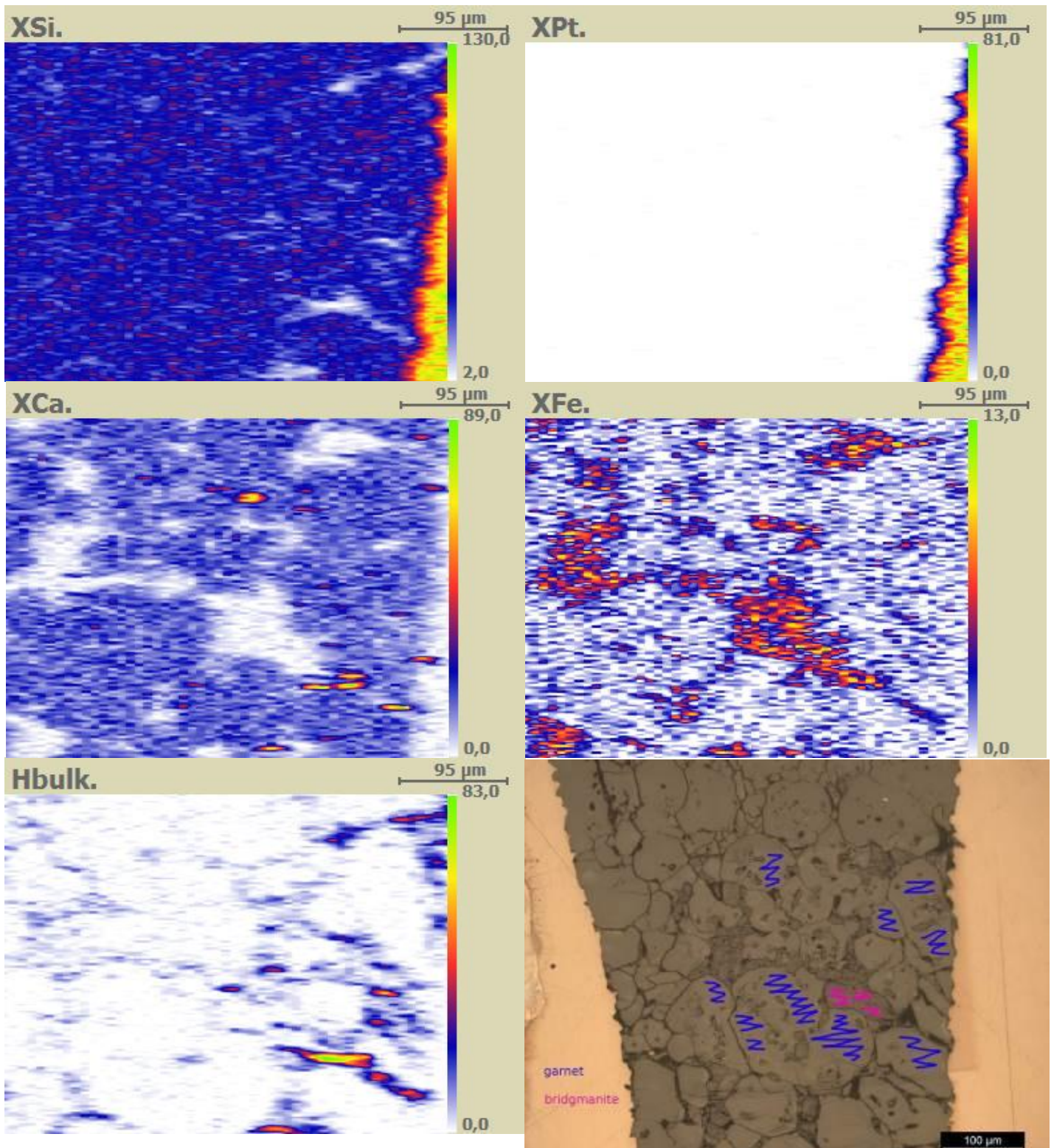


Figure 31 : S6292a2, global scans

H626292_1a

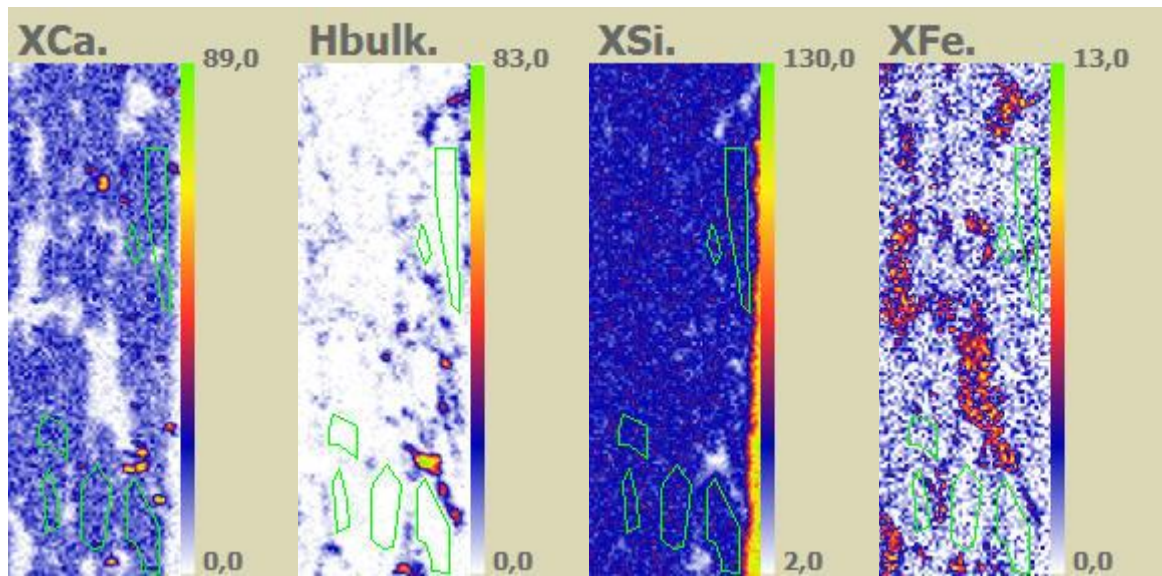


Figure 32 : S6292a2_r1, region of interest

5.10 S6278b

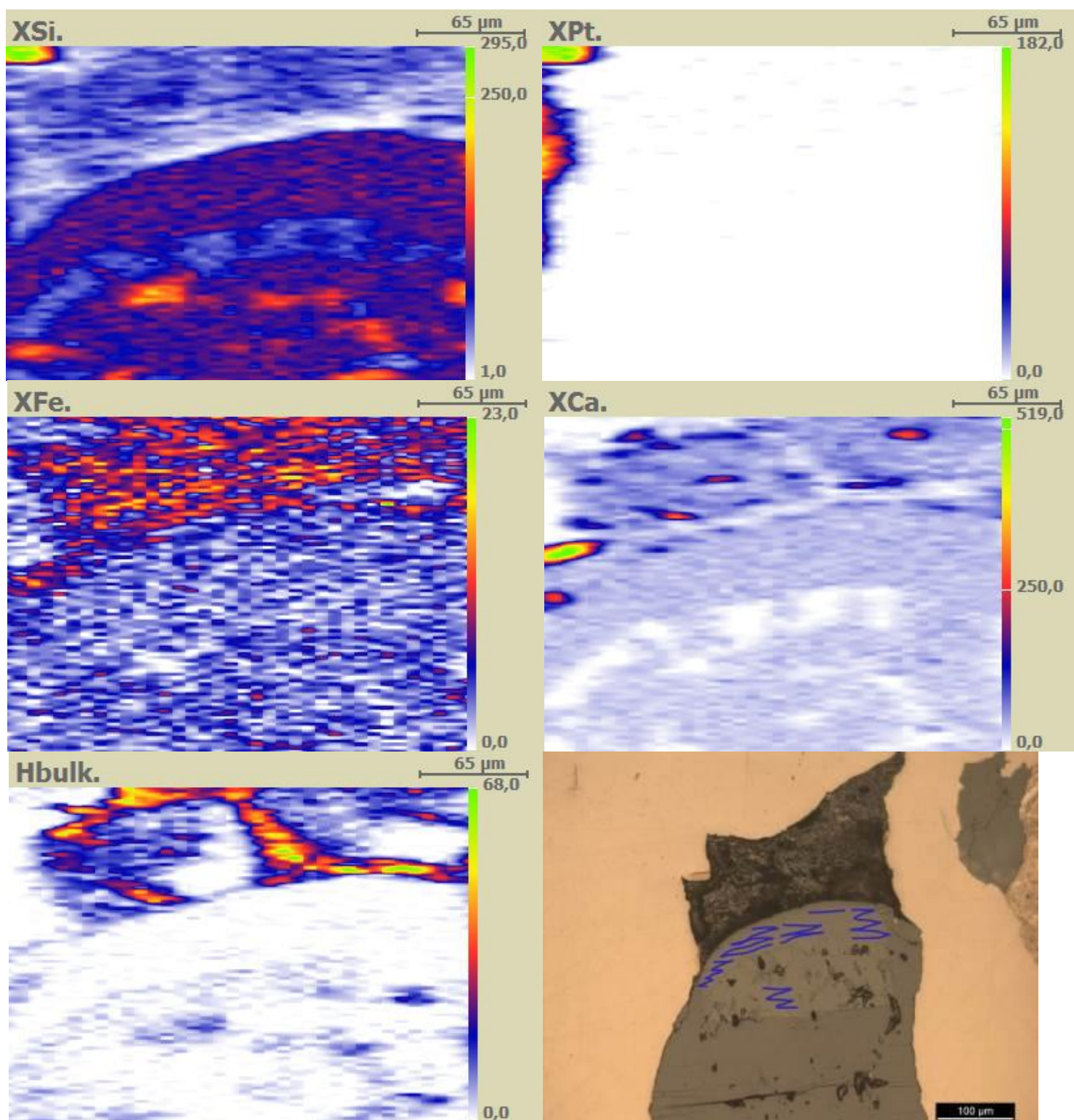


Figure 33 : S6278b, global scans

H6278_2

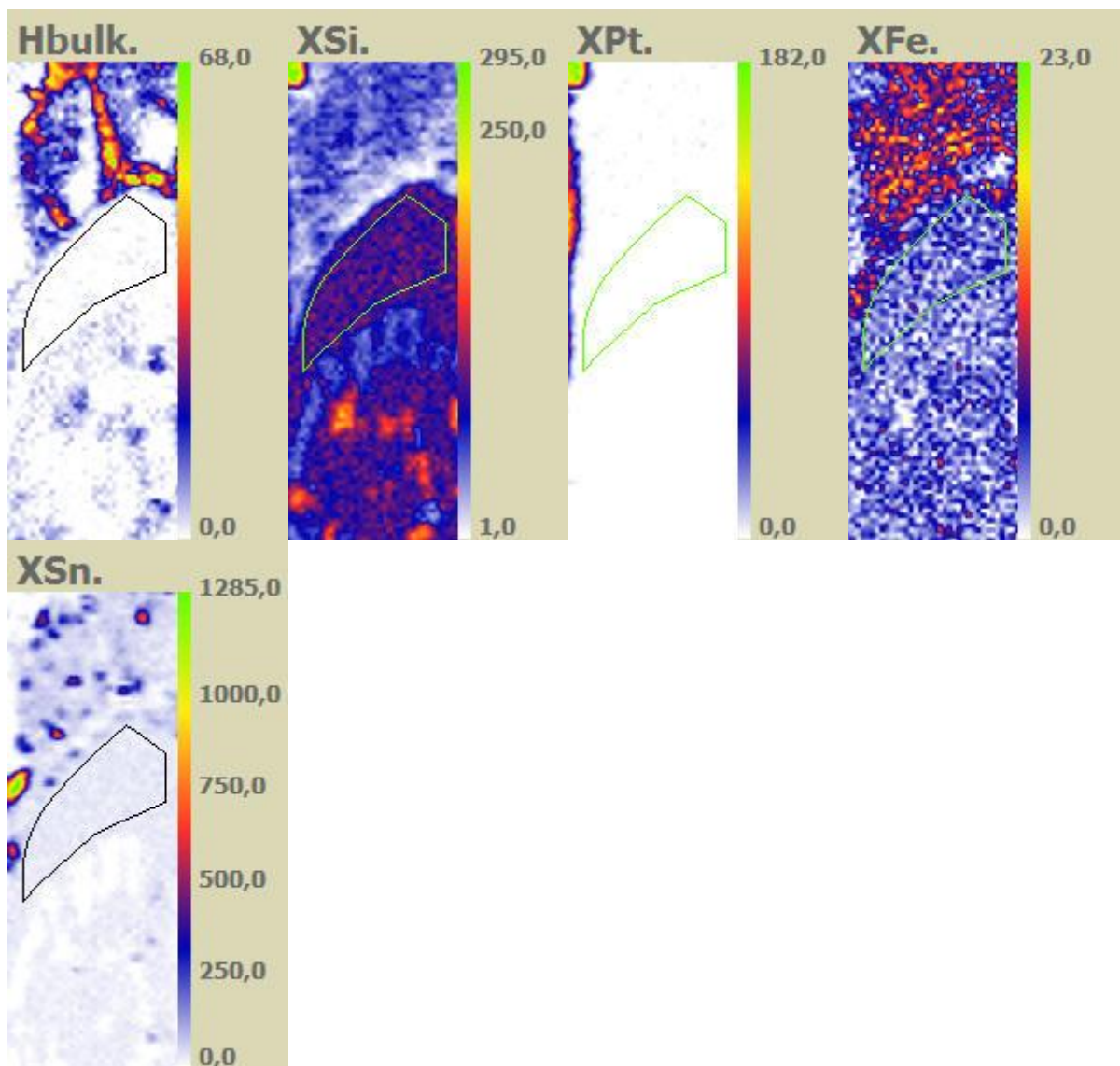


Figure 34 : S6278b_r1, region of interest

5.11 S6278a1

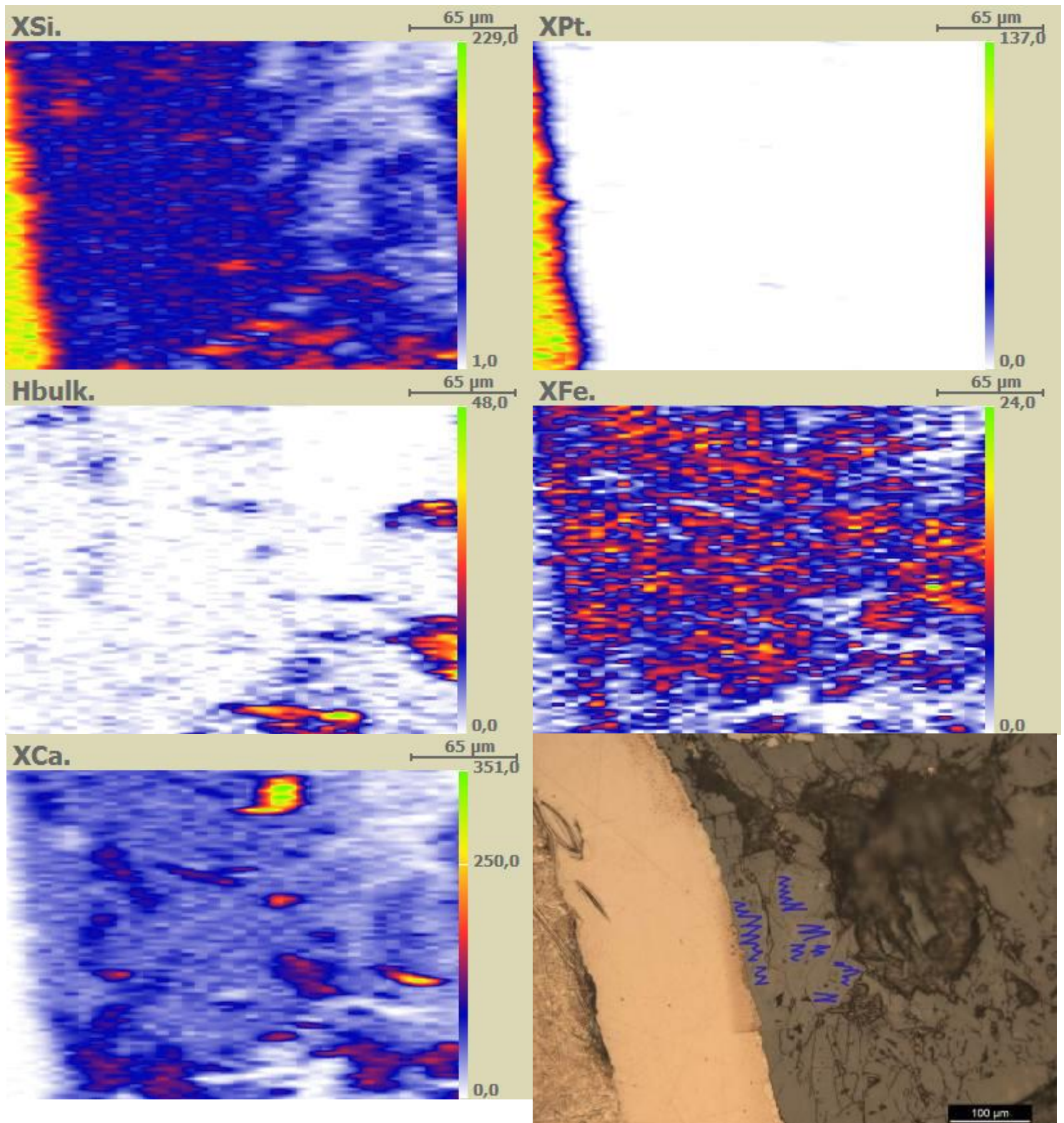


Figure 35 : S6278a1, global scans

H6278_1

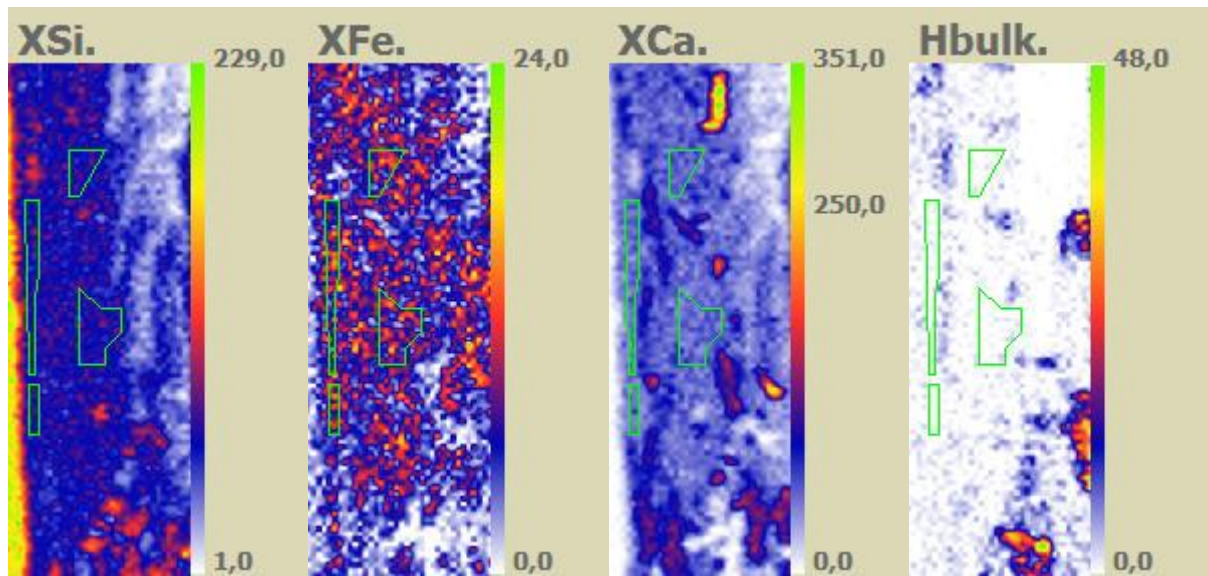


Figure 36 : S6278a1_r1, region of interest

Table 7: Measurement of 18 / 03 / 2015, results

run	phase	Jpg file	Percentage of the total map	[H] At ppm	[H] Wt ppm	[H ₂ O] Wt ppm
H4094a	bdg	H4094_1b	33,2	1390	70	625
H4094b	bdg	H4094_1	26,3	920	46	413
RK3		RK3	100,0	420	19	172
S6239a	stv	S6239_2	6,0	48800	2589	23099
S6239b	stv	S6239_1	9,6	53500	2854	25456
S6278a1	g	S6278_1	8,1	1880	91	808
S6278b	g	S6278_2	14,2	1210	60	534
S6292a1	g	H626292_1b	11,4	2460	122	1090
S6292a2	g	H626292_1a	10,3	3130	156	1387
S6292b	g	H626292_2	30,6	1780	81	720

6 RESULTS

Table 8: result of the analysis of H

sample		H at ppm	H wt ppm	H ₂ O wt ppm	total relative uncertainty on H concentr. %
H4095a1	stv	42450	2234	19931	13,659
H4095a2	stv	42400	2231	19906	13,662
H4095b1	stv	49400	2624	23407	13,657
H4148a1	g	3300	162	1444	13,892
H4148a2	bdg	2250	109	971	14,013
H4148b1	g	4690	234	2086	13,816
H4113a1	bdg	4960	243	2167	13,809
H4113a2	bdg	7920	389	3472	13,746
H4094a	bdg	1390	70	625	14,223
H4094b	bdg	920	46	413	14,509
RK3		420	19	172	15,635
S6239a	stv	48800	2589	23099	13,665
S6239b	stv	53500	2854	25456	13,664
S6278a1	g	1880	91	808	14,095
S6278b	g	1210	60	534	14,319
S6292a1	g	2460	122	1090	13,981
S6292a2	g	3130	156	1387	13,911
S6292b	g	1780	81	720	14,149