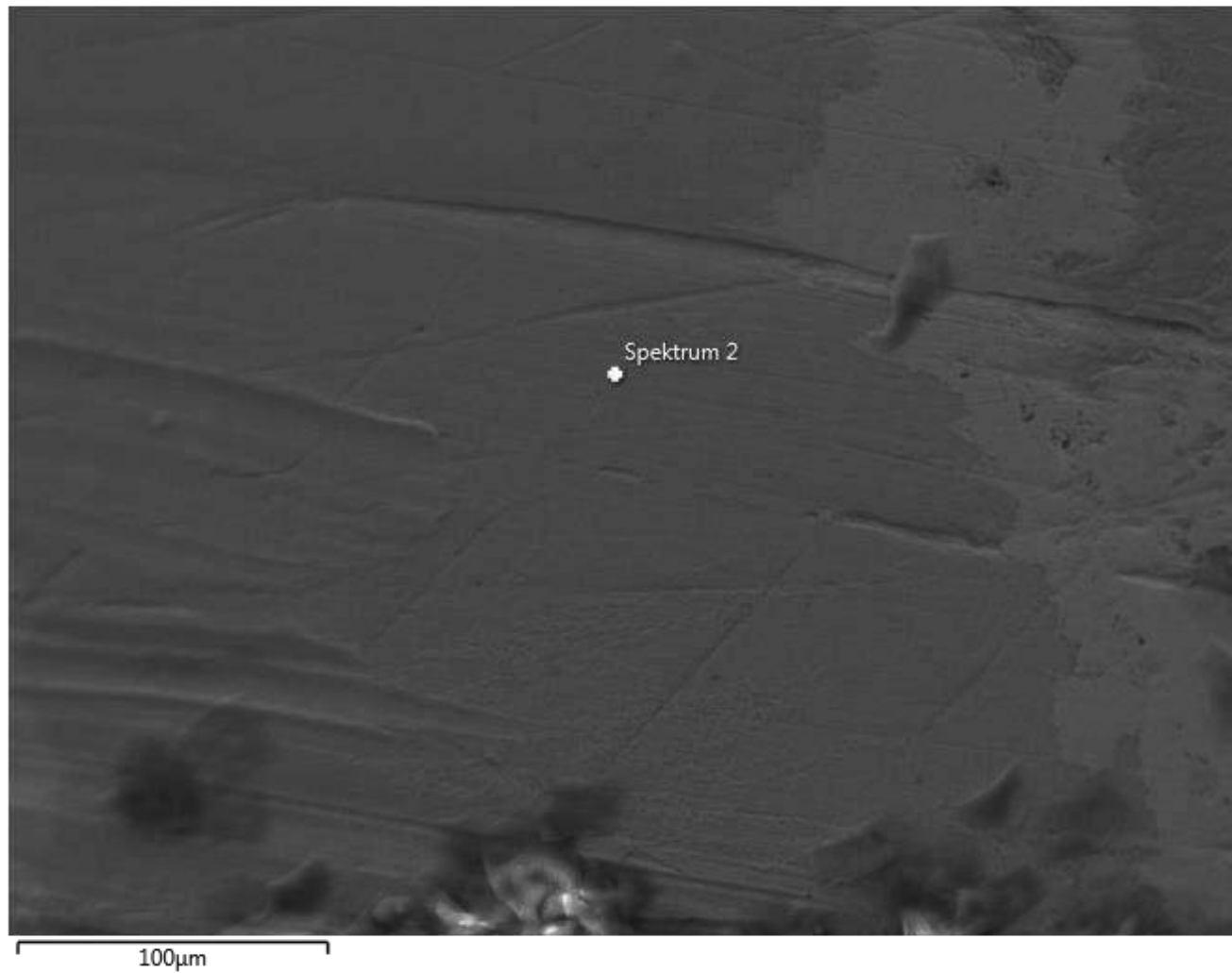
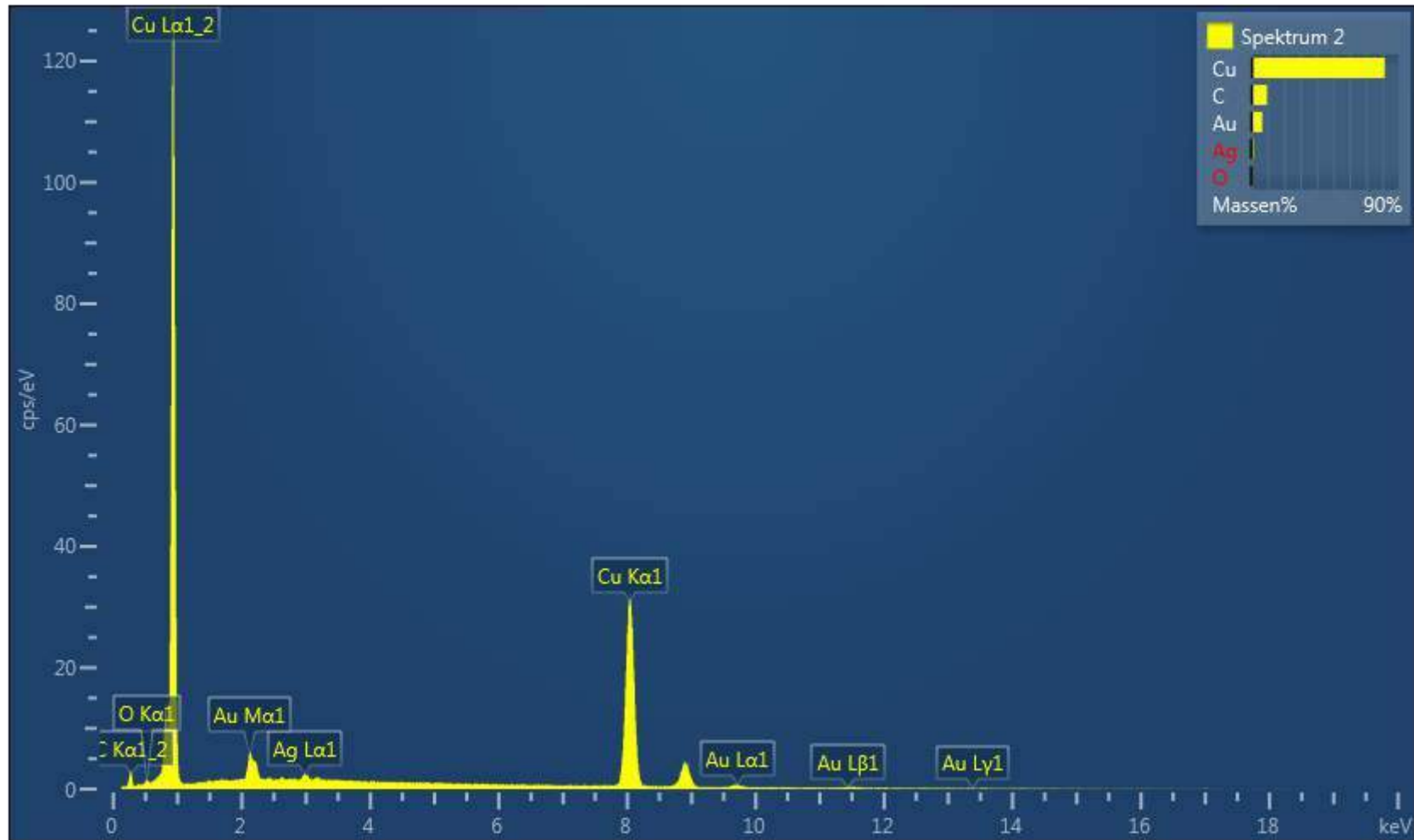


SEM image of Mokume Gane Ring with Shakudo* (96% Cu, 4% Au). EXP. 23 (Nov. 2017 : wearing on hand). Soldering seam?
*Alternative terminology, see: Ford Hallam, *Japanese Metalworking Technique* (Mommersteeg Vormgeving, *forthcoming*).

Elektronenbild 5



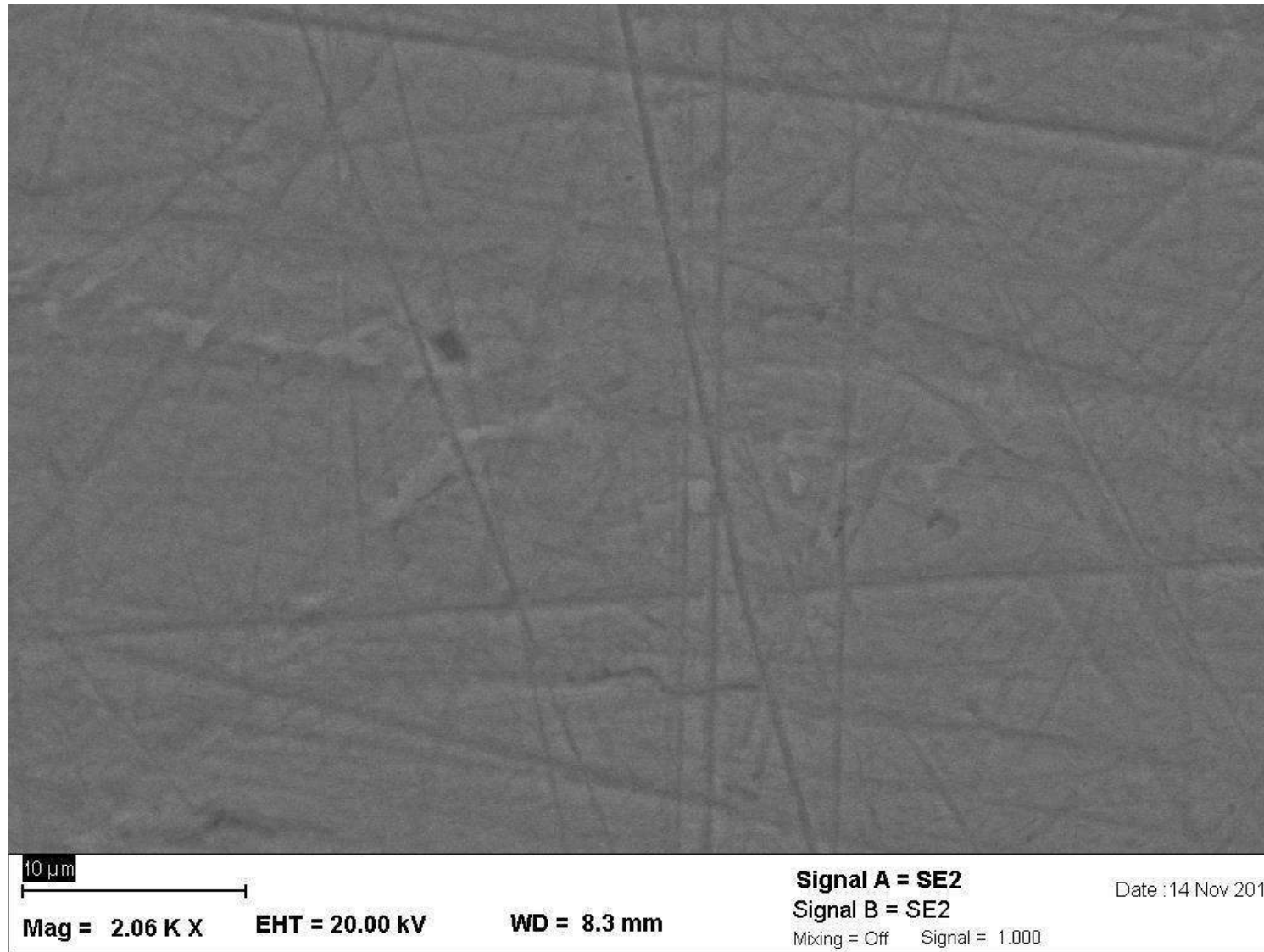


Spektrum 2 Massen% Massen% Sigma

C	9.68	0.48
O	0.81	0.14
Cu	81.40	0.54
Ag	1.37	0.14
Au	6.74	0.30
Gesamt	100.00	

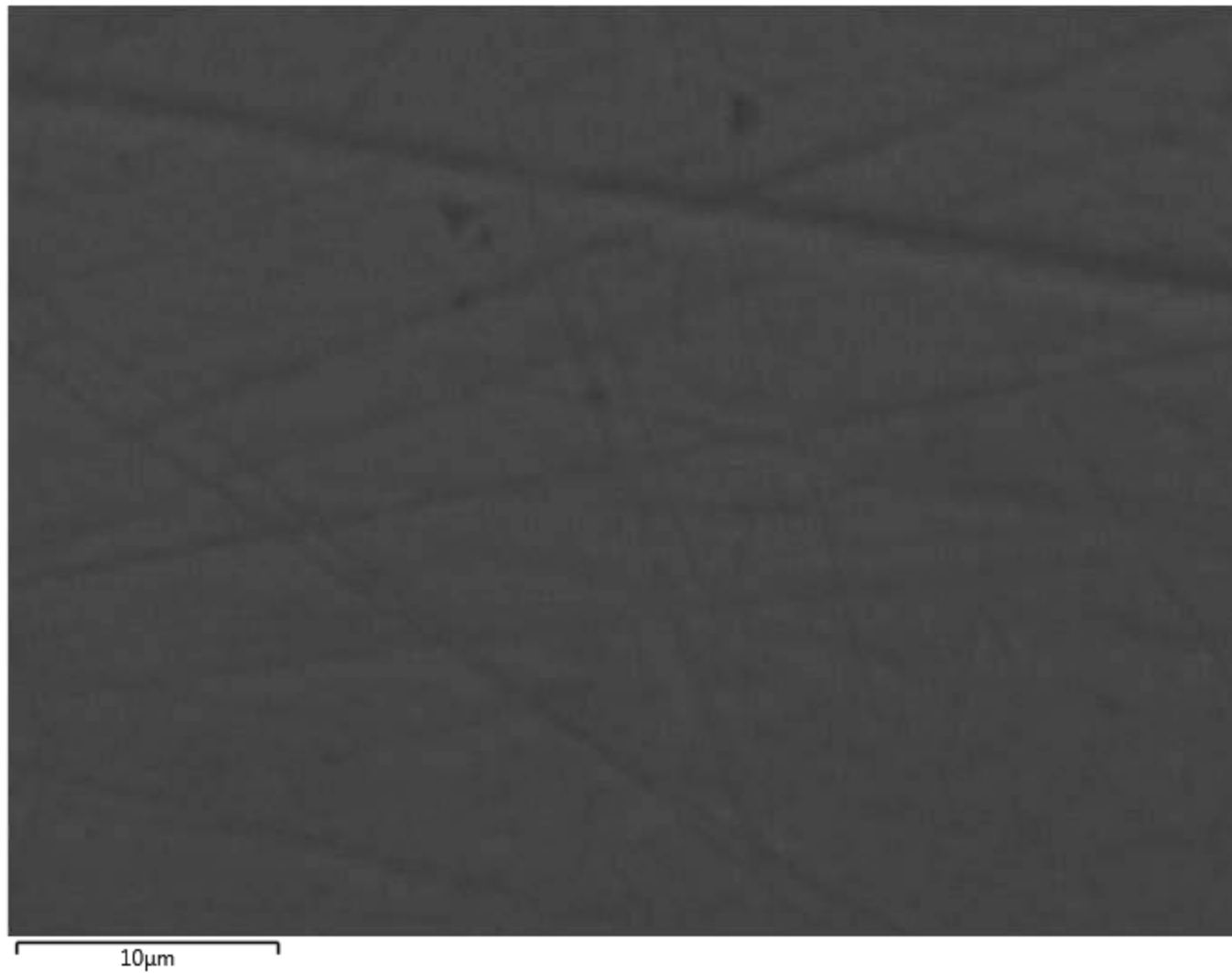
Spektrum 2 Atom %

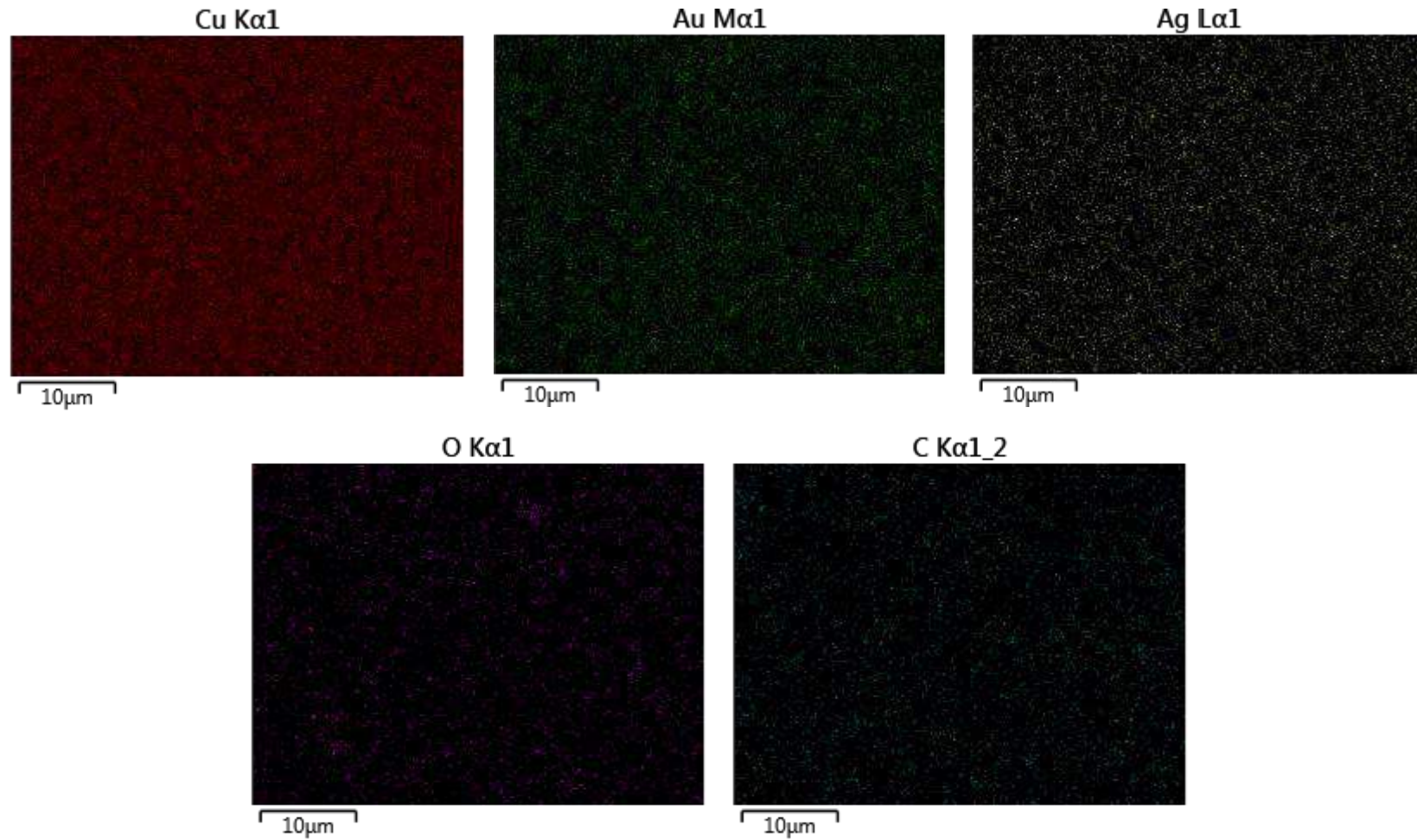
C	36.90
O	2.30
Cu	58.64
Ag	0.58
Au	1.57
Gesamt	100.00



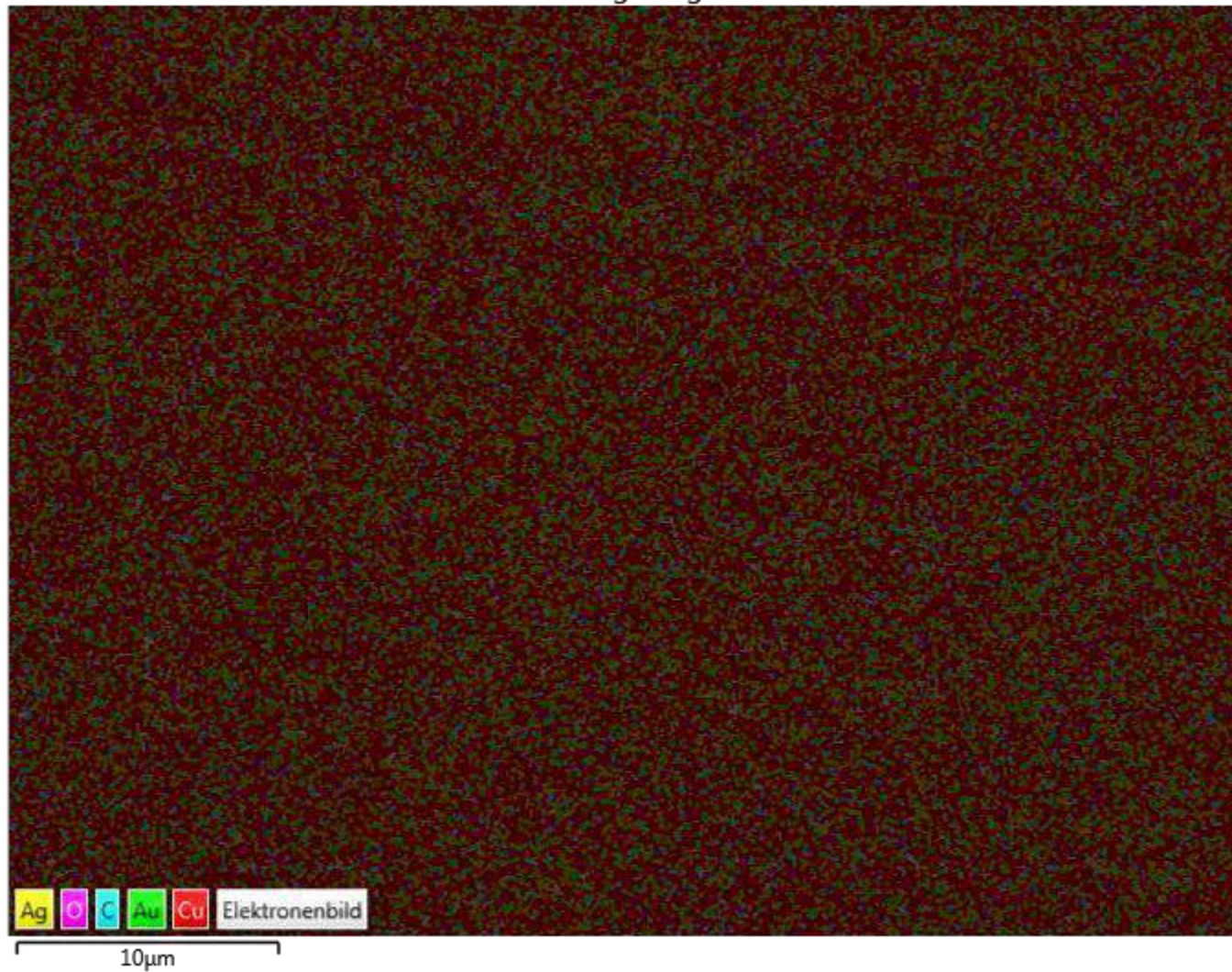
SEM image of Mokume Gane Ring – Shakudo (black part).

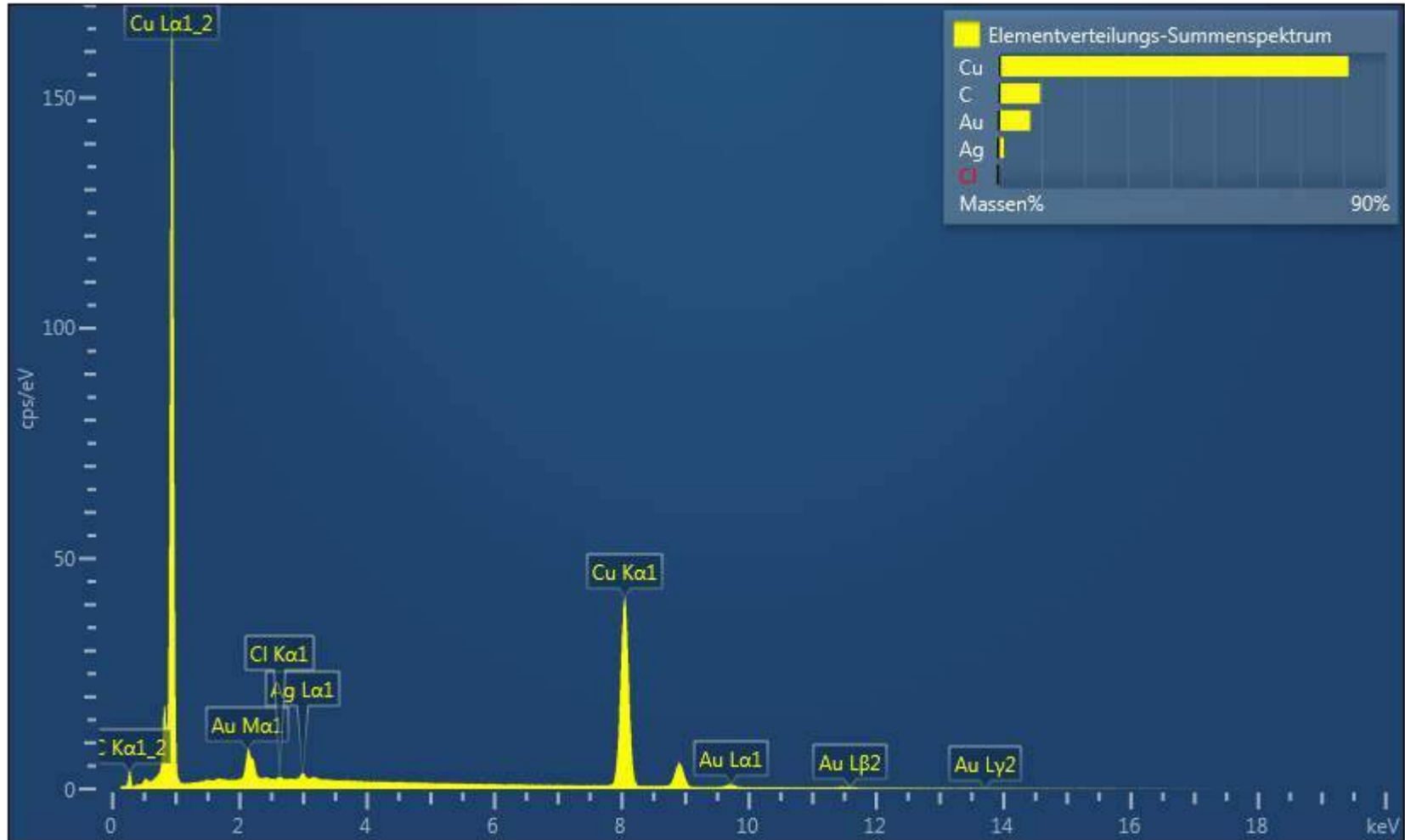
Elektronenbild 6





EDS-Überlagerungsbild 4





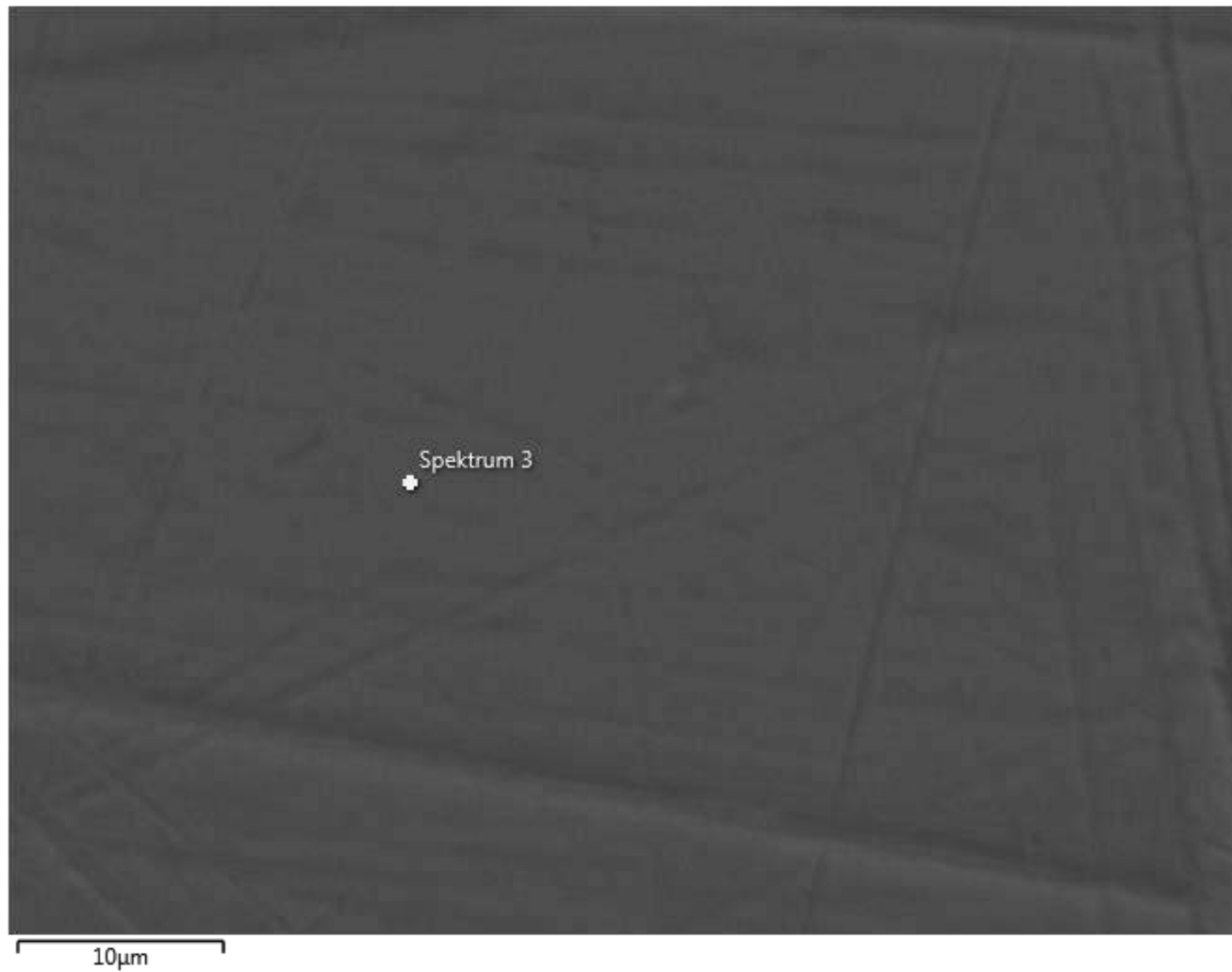
Elementverteilungs-Summenspektrum Atom %

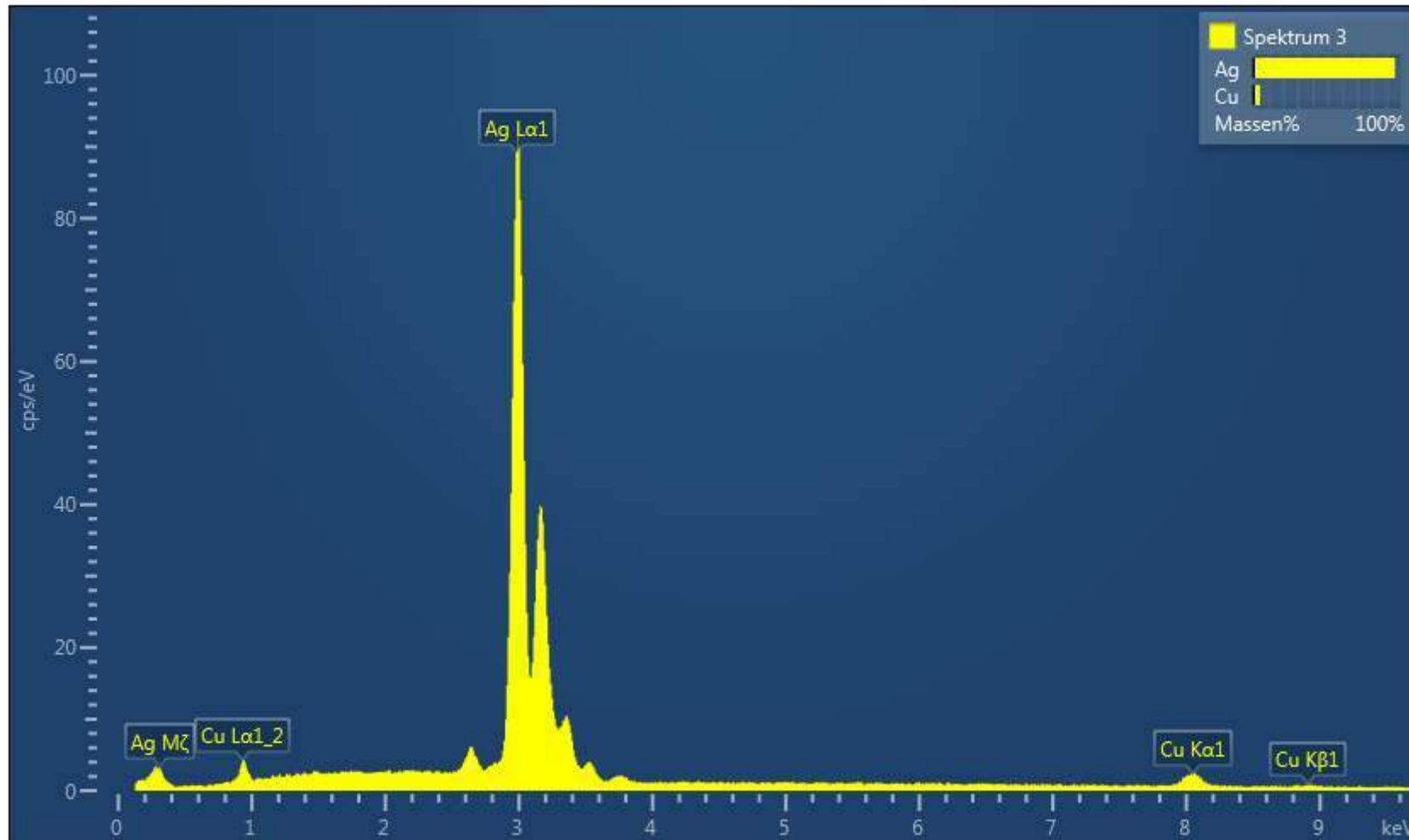
C	37.82
Cl	0.26
Cu	59.56
Ag	0.59
Au	1.77
Gesamt	100.00

Elementverteilungs-Summenspektrum Massen% Massen% Sigma

C	9.75	0.31
Cl	0.20	0.03
Cu	81.23	0.35
Ag	1.36	0.09
Au	7.46	0.21
Gesamt	100.00	

Elektronenbild 7





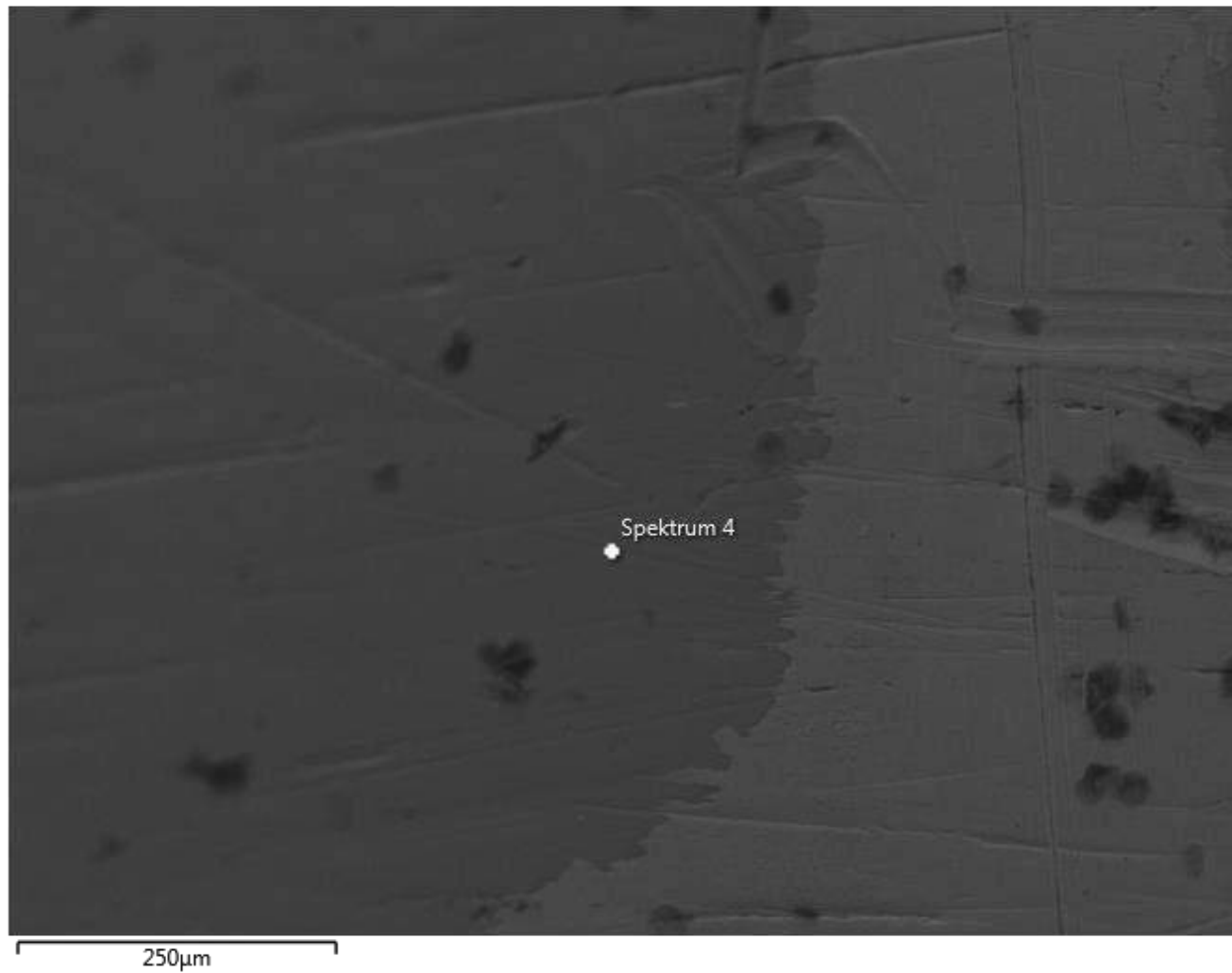
Spektrum 3 Massen% Massen% Sigma

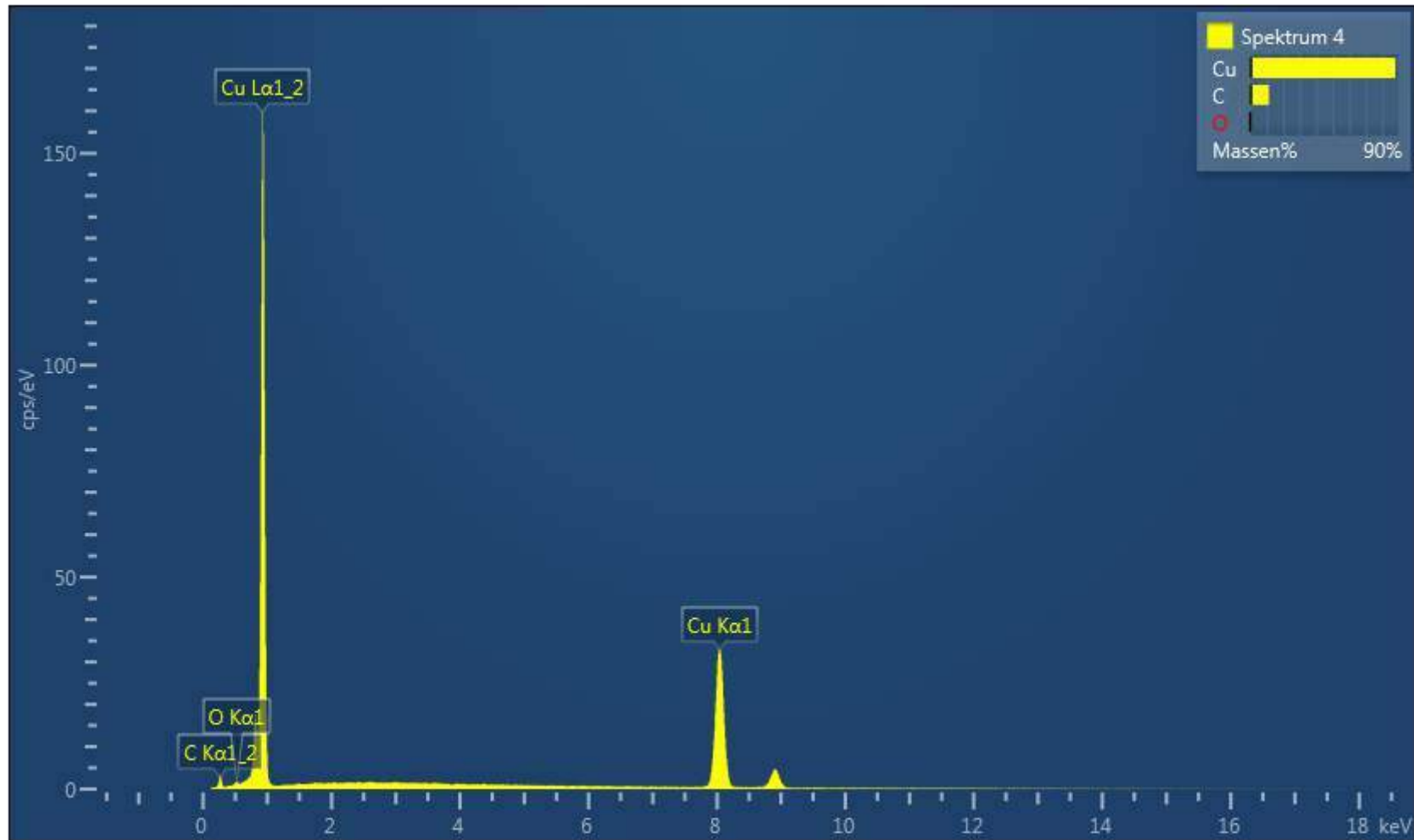
Cu	4.42	0.21
Ag	95.58	0.21
Gesamt	100.00	

Spektrum 3 Atom %

Cu	7.28
Ag	92.72
Gesamt	100.00

Elektronenbild 9





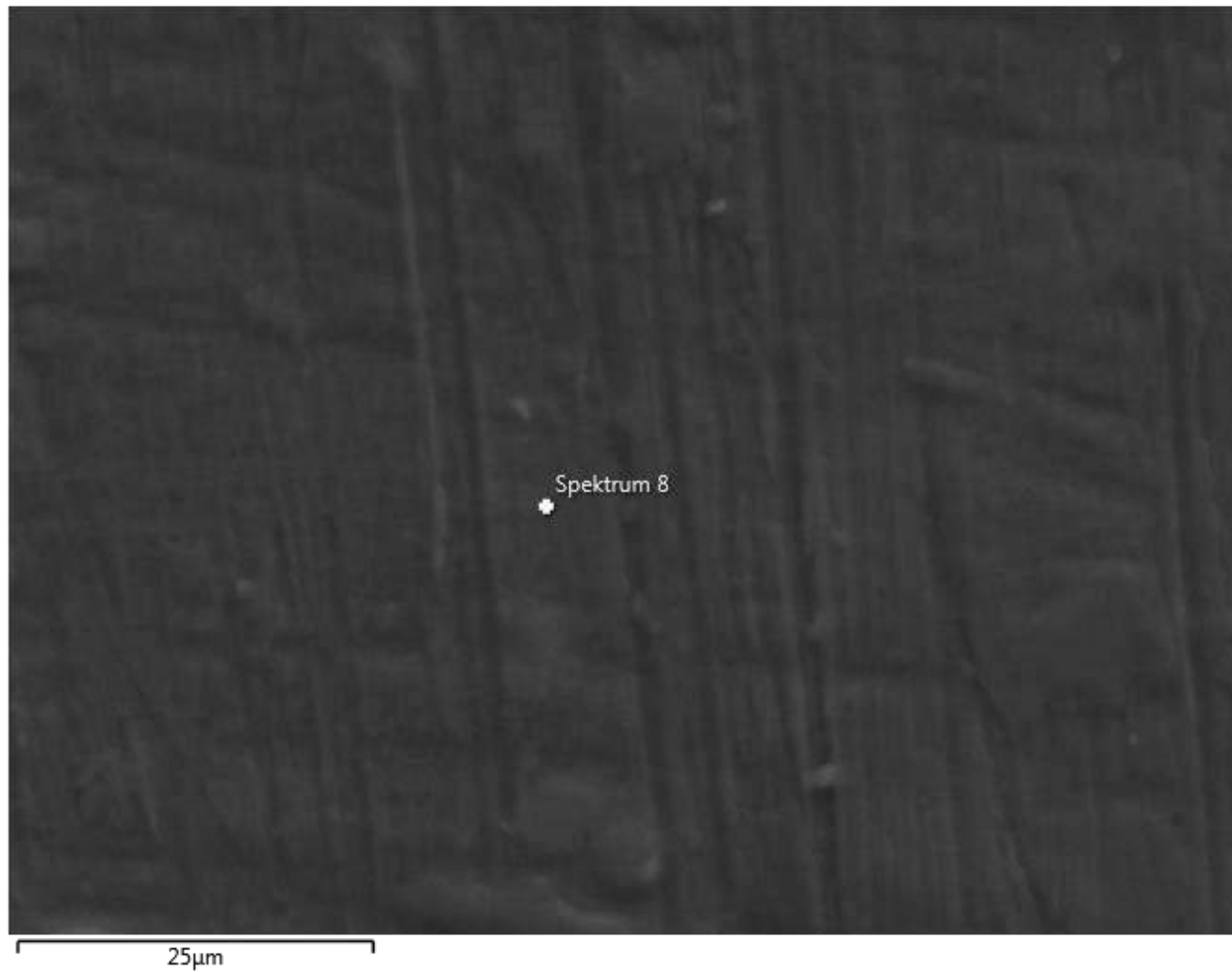
Spektrum 4 Massen% Massen% Sigma

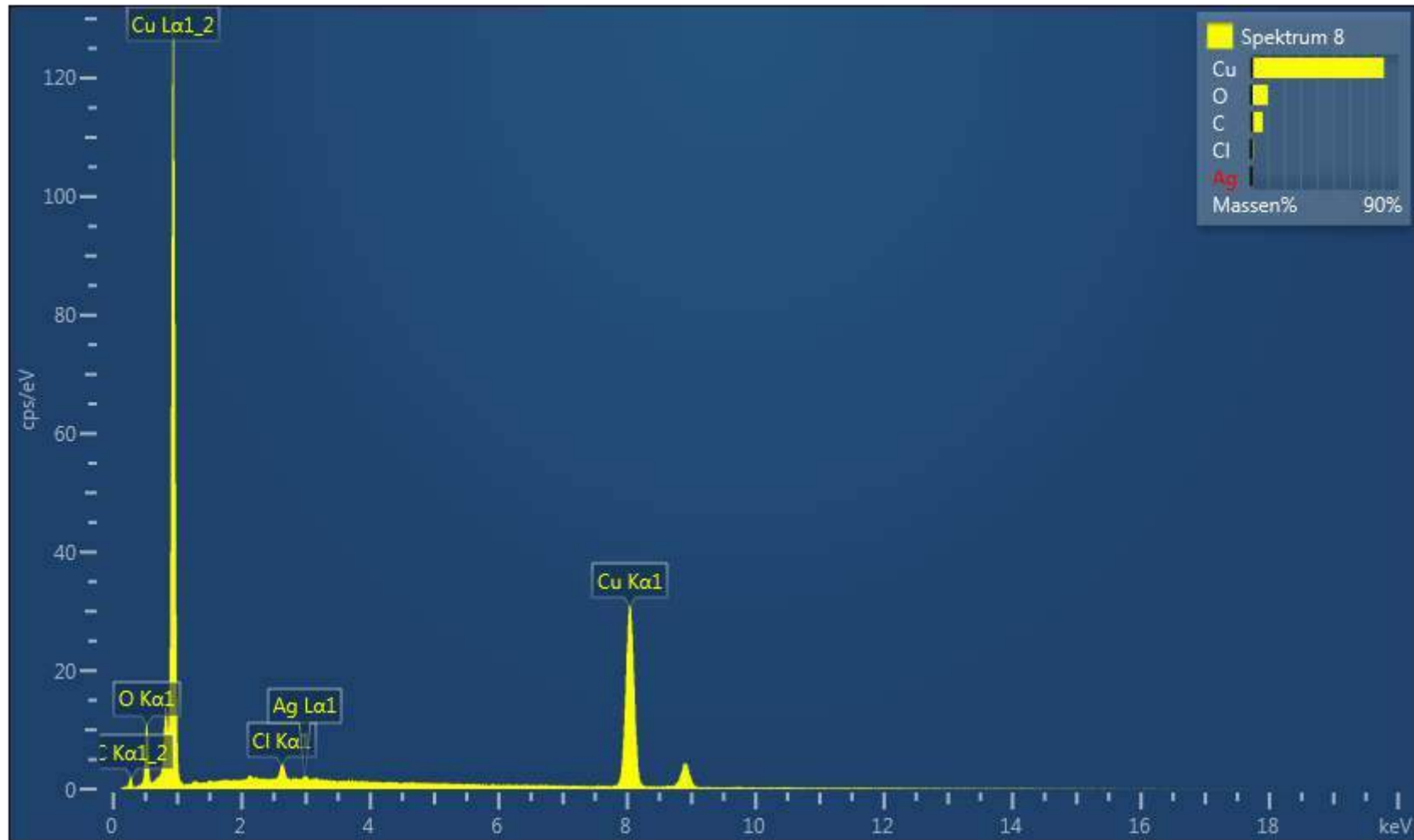
C	11.34	0.52
O	0.74	0.15
Cu	87.92	0.53
Gesamt	100.00	

Spektrum 4 Atom %

C	39.78
O	1.95
Cu	58.28
Gesamt	100.00

Elektronenbild 13



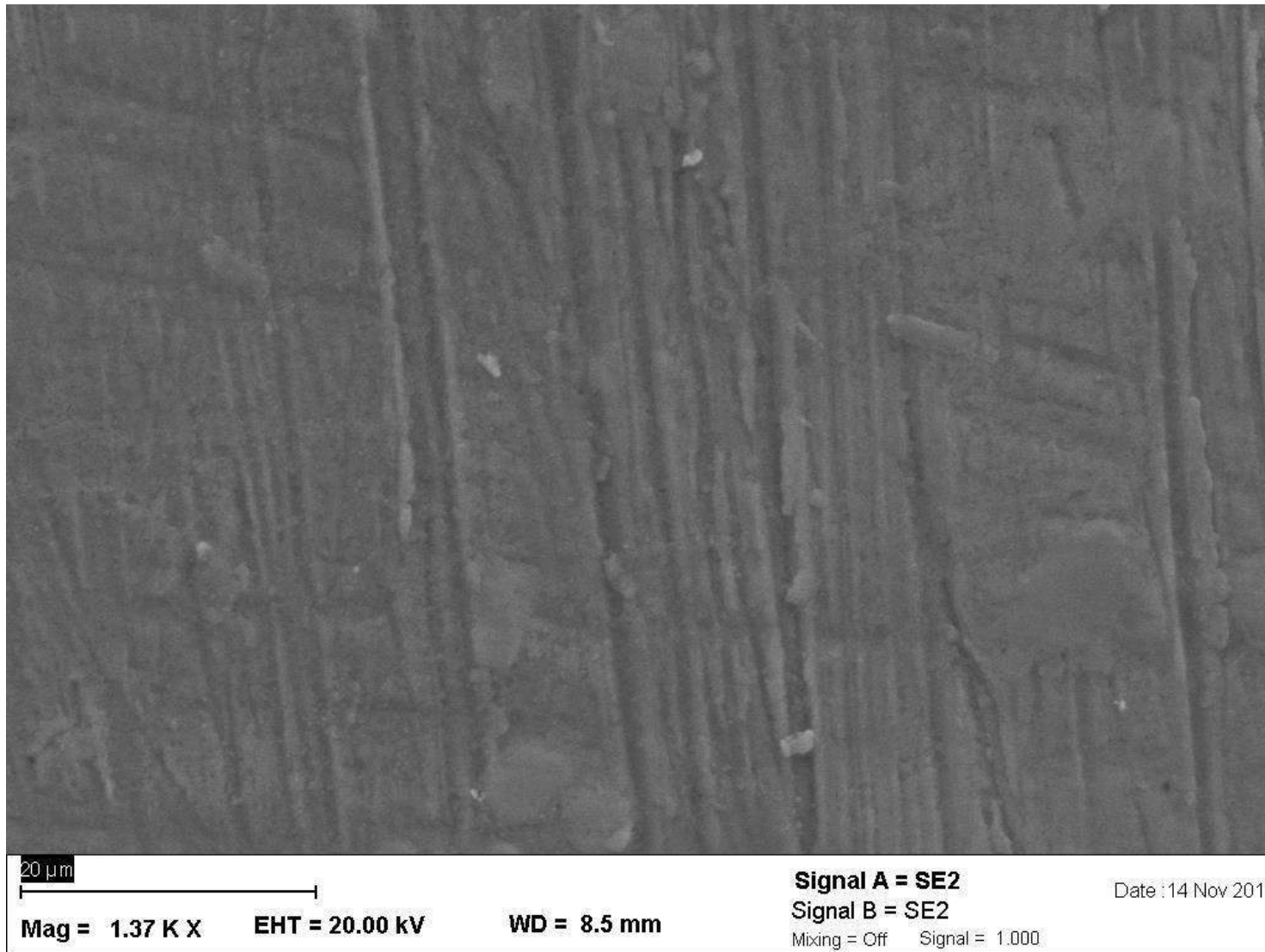


Spektrum 8 Massen% Massen% Sigma

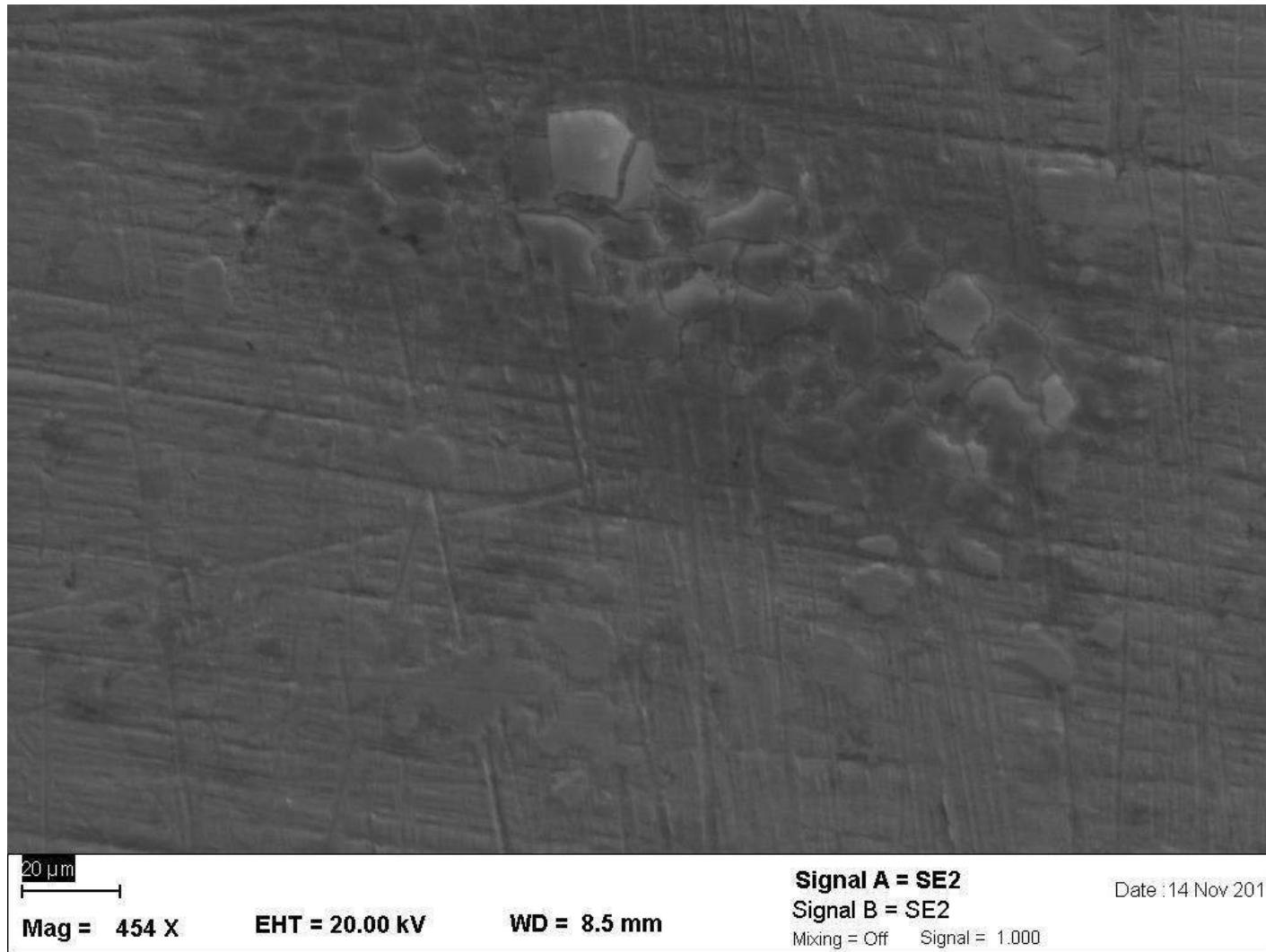
C	7.04	0.43
O	10.11	0.22
Cl	1.19	0.06
Cu	80.93	0.45
Ag	0.73	0.13
Gesamt	100.00	

Spektrum 8 Atom %

C	23.15
O	24.96
Cl	1.32
Cu	50.30
Ag	0.27
Gesamt	100.00



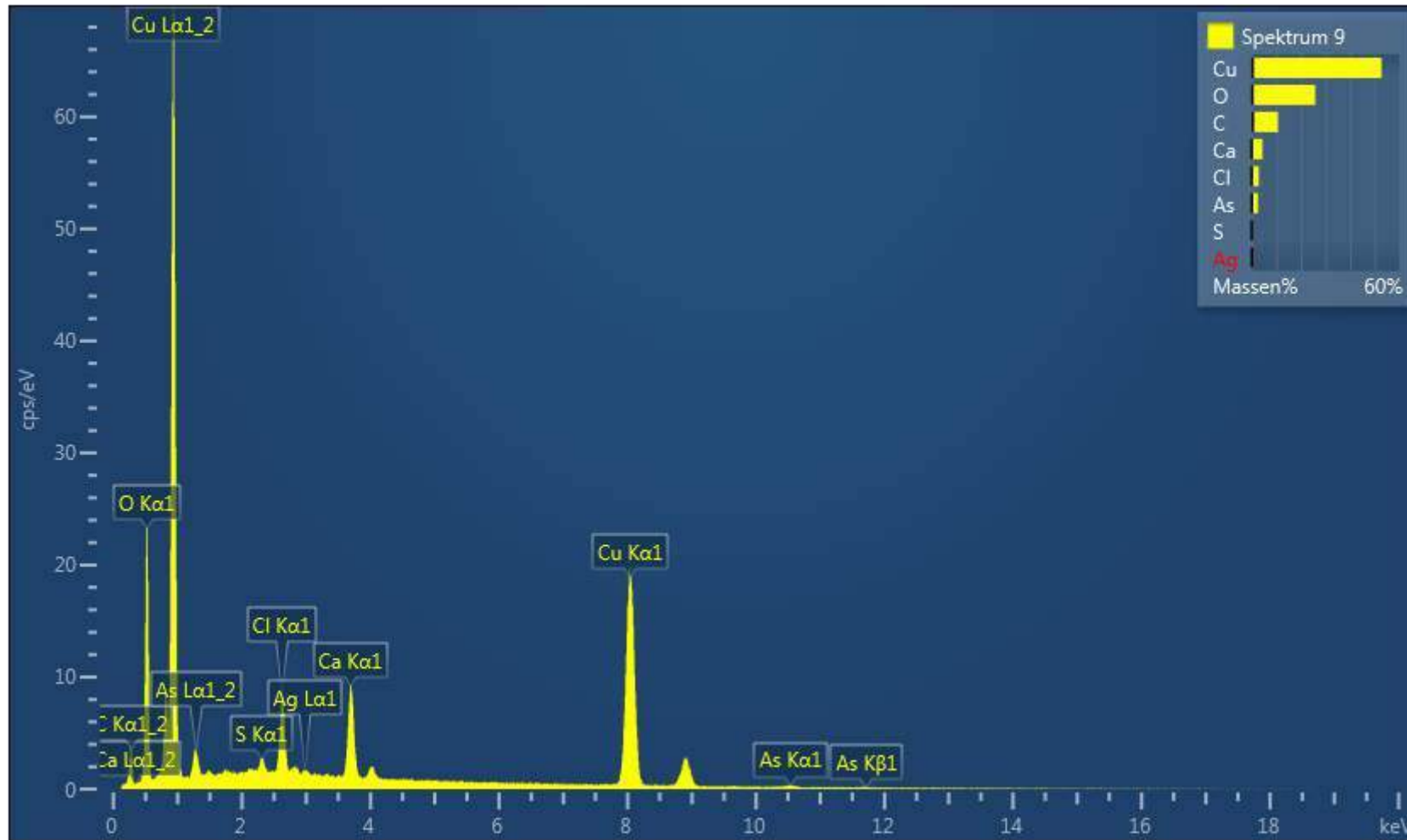
SEM image of Alloy 2a1. Patinated with seawater. No cuprite observed.



SEM image of Alloy 2a1. Patinated with seawater. No cuprite observed.

Elektronenbild 15





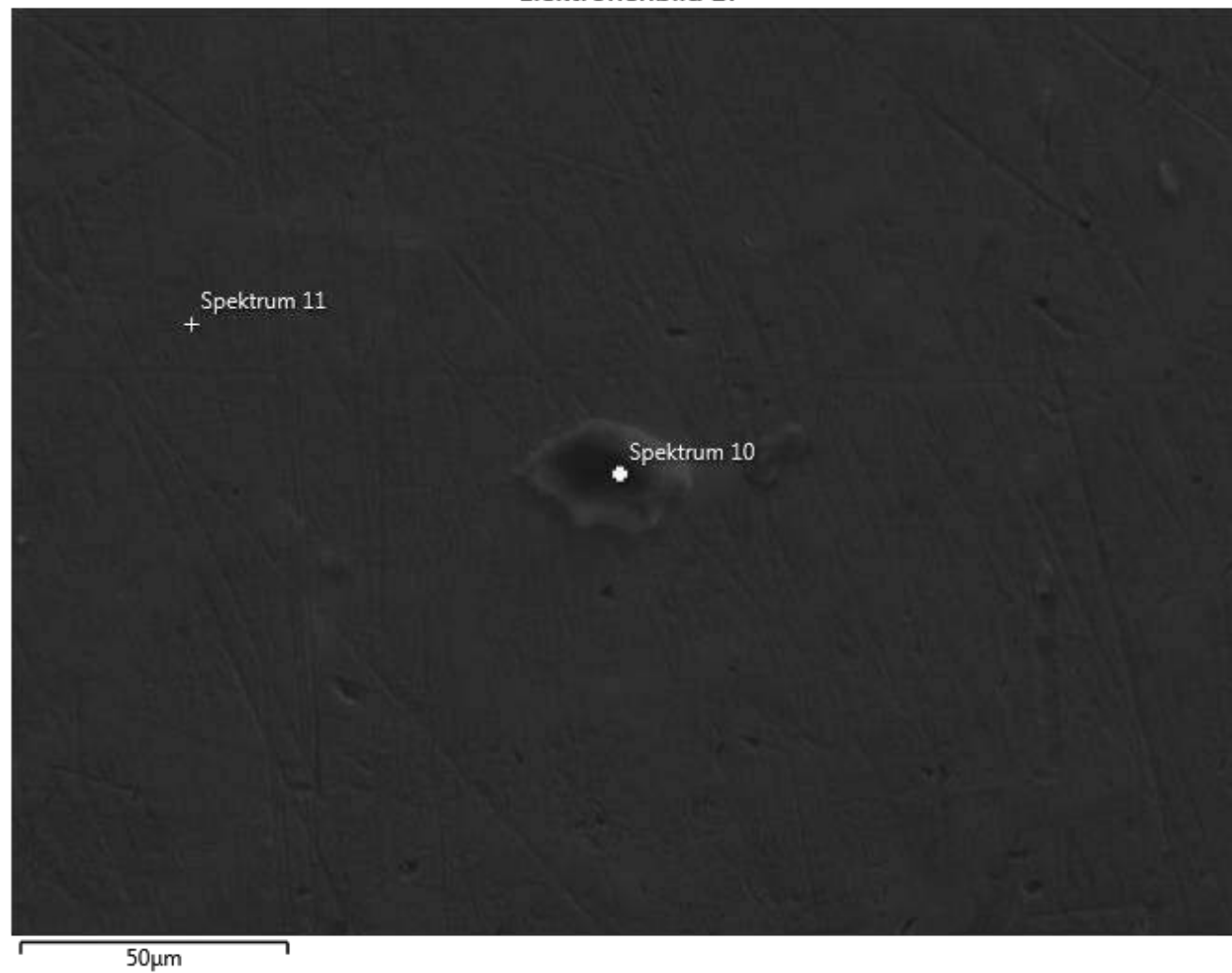
Spektrum 9 Massen% Massen% Sigma

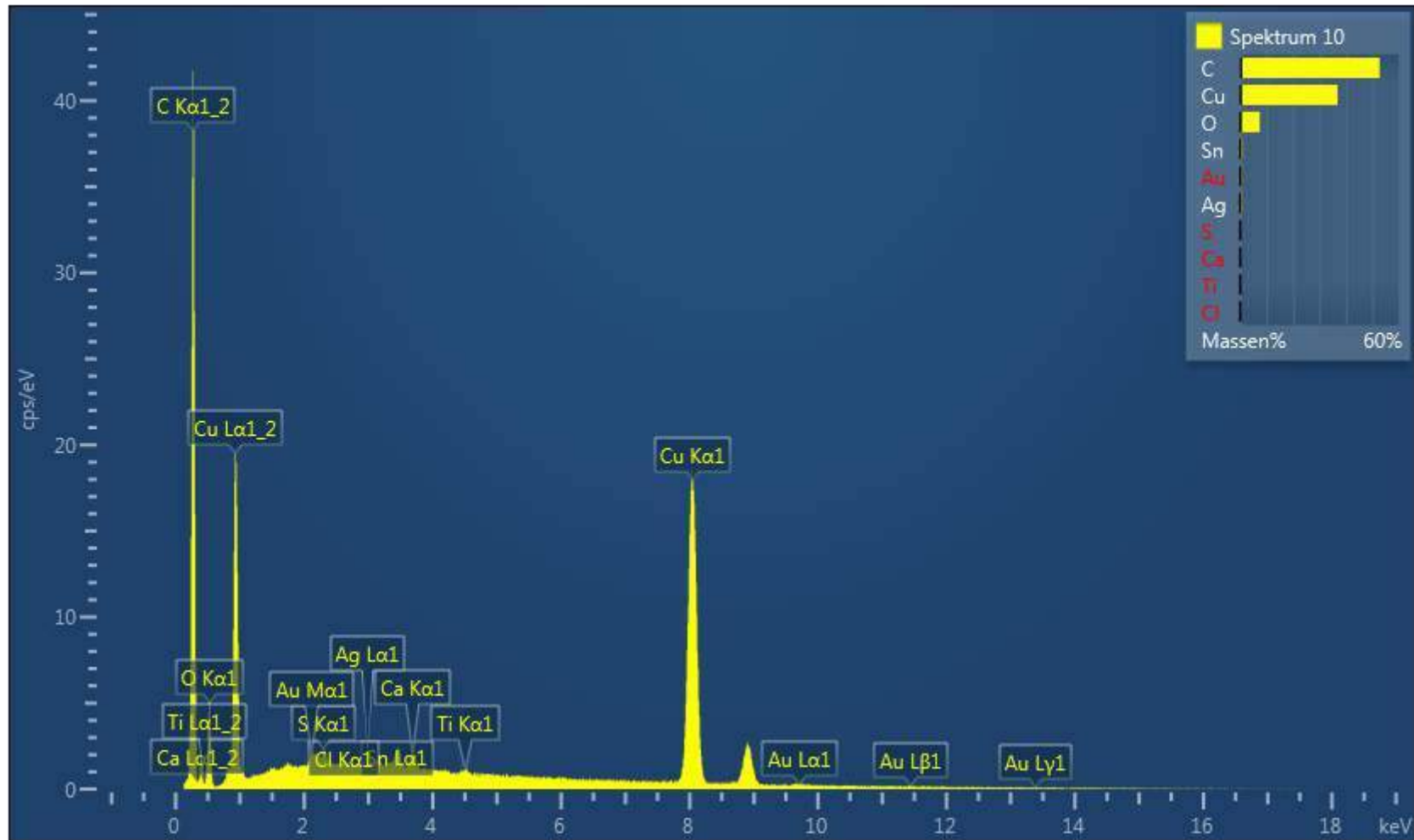
C	10.62	0.49
O	25.84	0.30
S	0.52	0.05
Cl	2.93	0.06
Ca	4.35	0.08
Cu	52.76	0.40
As	2.52	0.17
Ag	0.47	0.10
Gesamt	100.00	

Spektrum 9 Atom %

C	24.74
O	45.18
S	0.45
Cl	2.31
Ca	3.04
Cu	23.23
As	0.94
Ag	0.12
Gesamt	100.00

Elektronenbild 17





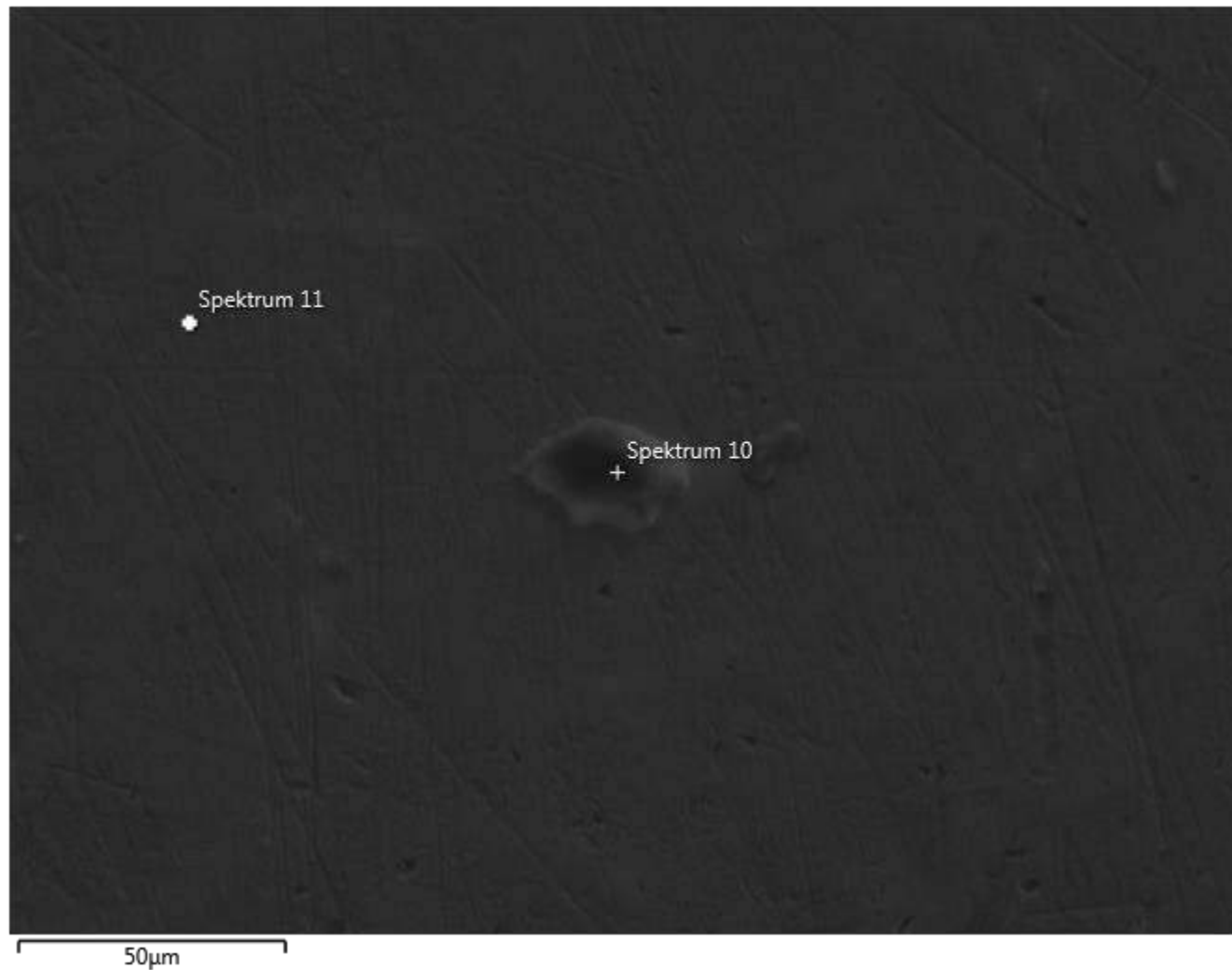
Spektrum 10 Massen% Massen% Sigma

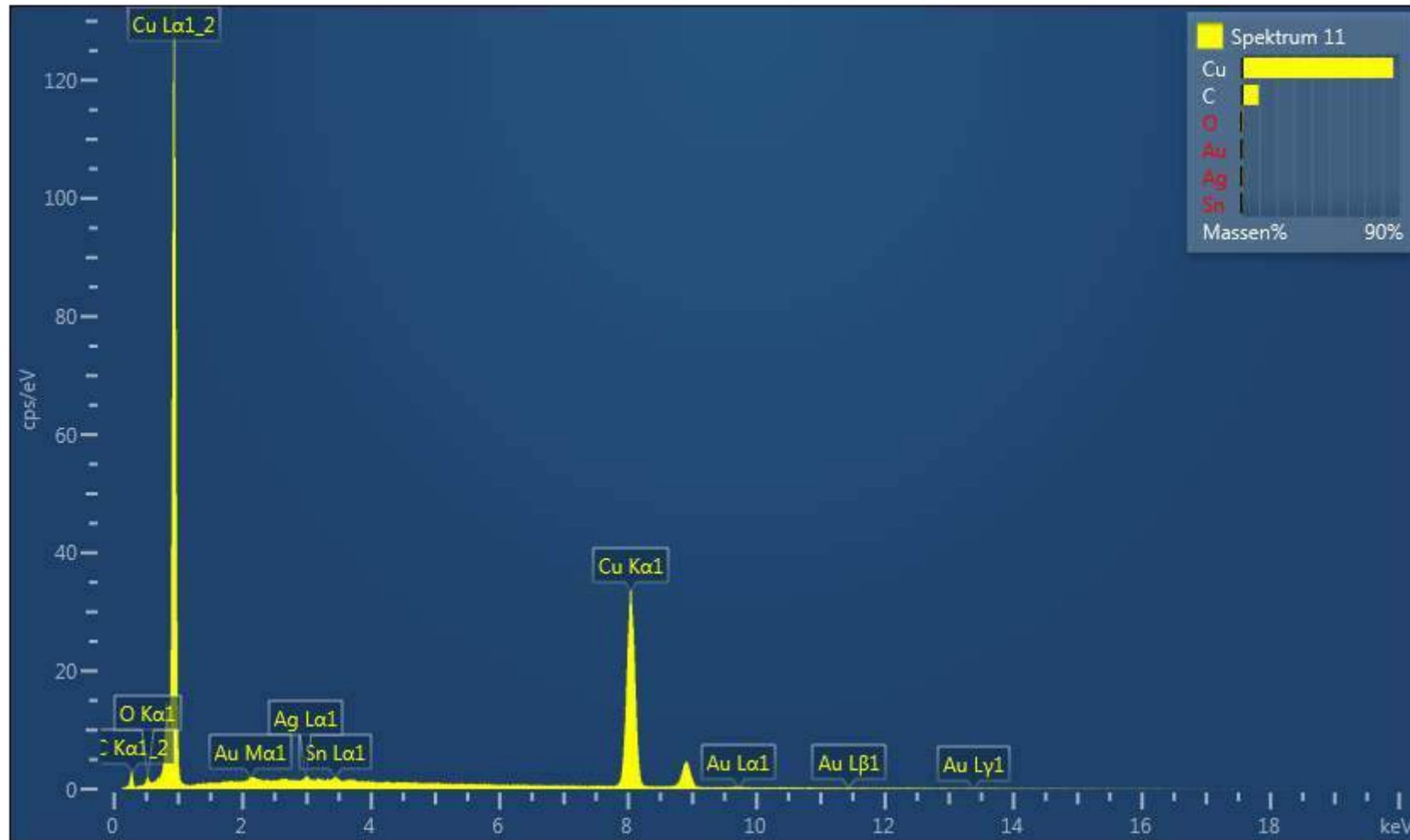
C	52.79	0.32
O	7.45	0.19
S	0.21	0.03
Cl	0.07	0.02
Ca	0.16	0.03
Ti	0.12	0.03
Cu	36.87	0.27
Ag	0.65	0.06
Sn	1.01	0.08
Au	0.67	0.11
Gesamt	100.00	

Spektrum 10 Atom %

C	80.29
O	8.51
S	0.12
Cl	0.04
Ca	0.07
Ti	0.05
Cu	10.60
Ag	0.11
Sn	0.15
Au	0.06
Gesamt	100.00

Elektronenbild 17





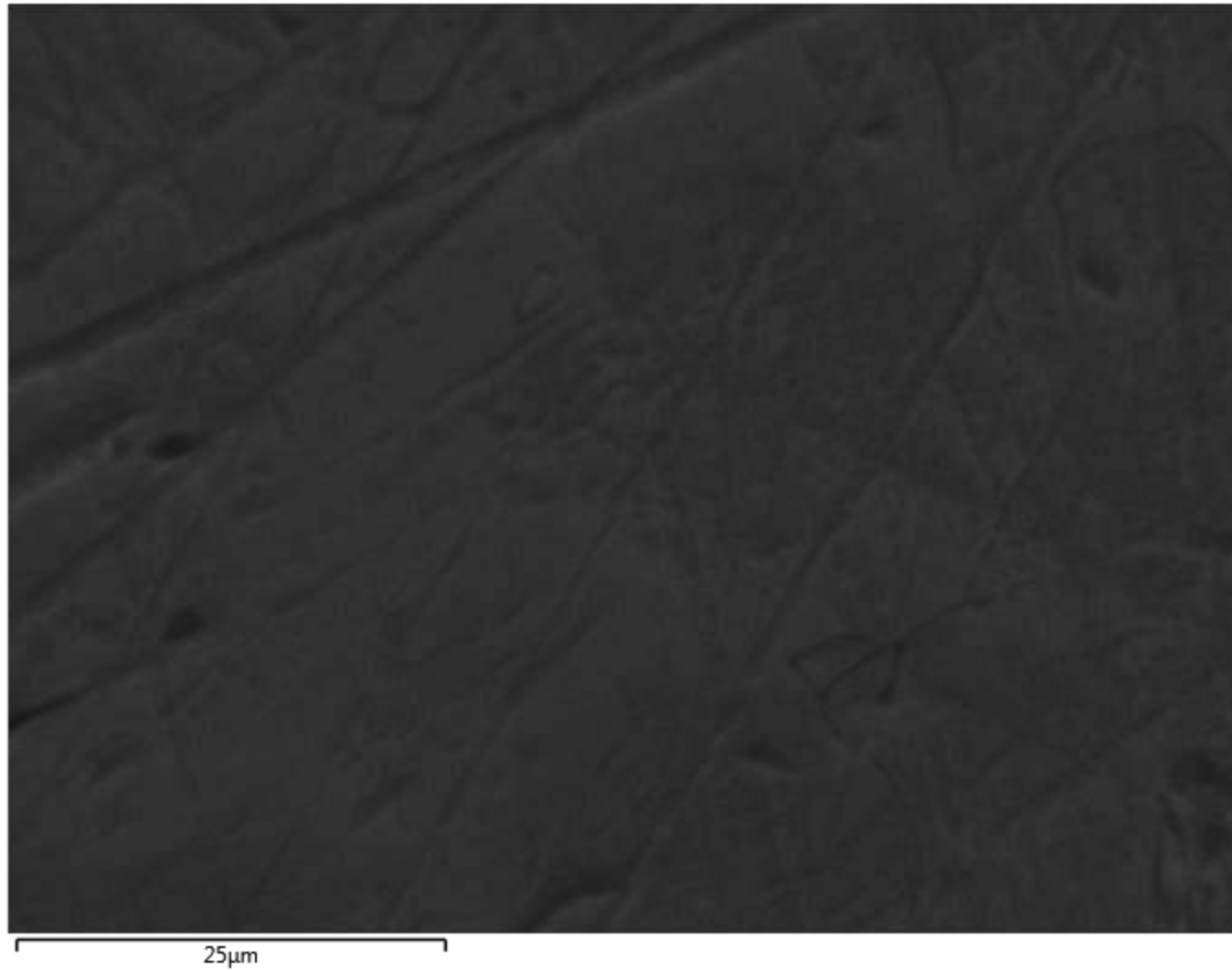
Spektrum 11 Massen% Massen% Sigma

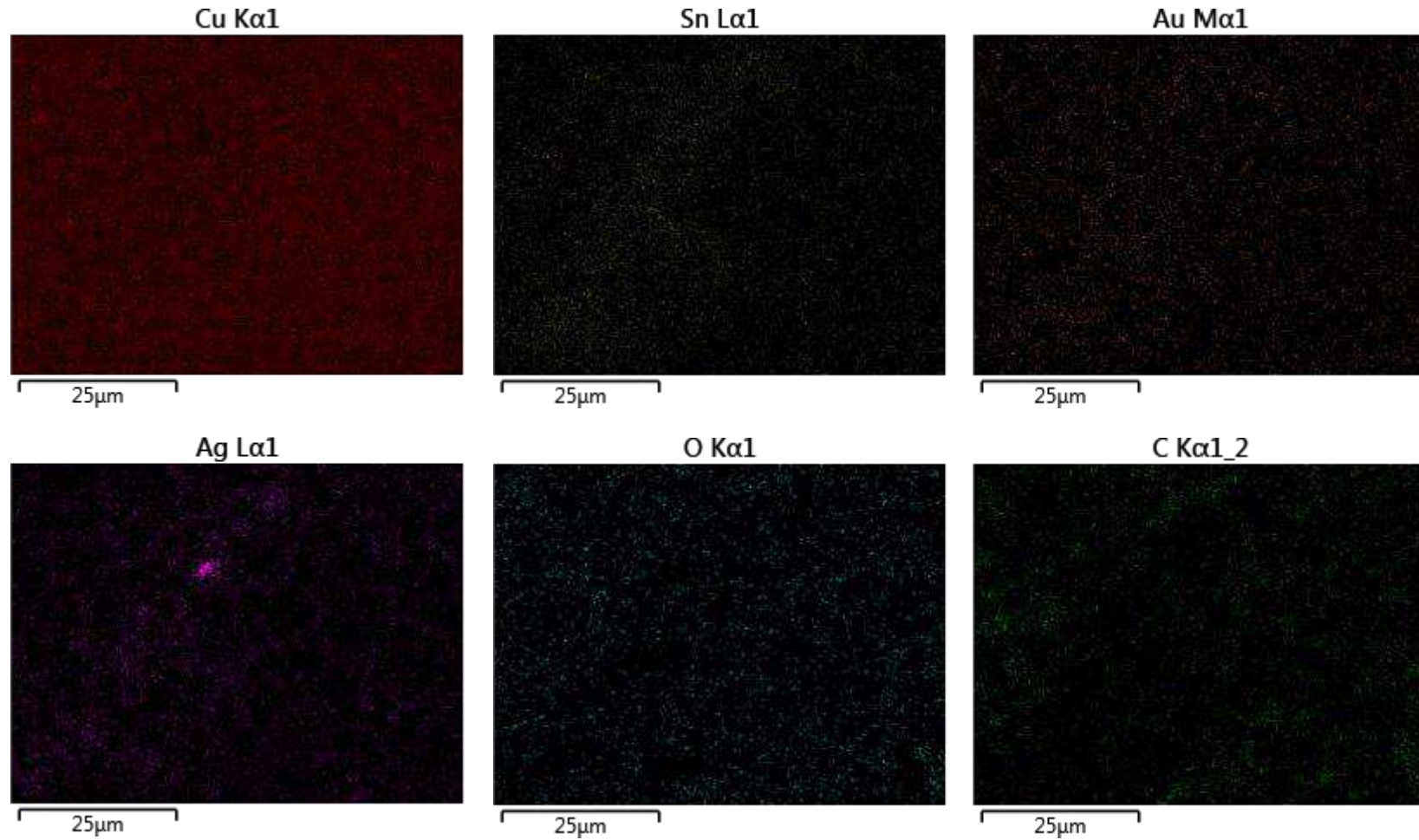
C	9.76	0.47
O	1.27	0.14
Cu	86.29	0.53
Ag	0.92	0.13
Sn	0.78	0.12
Au	0.97	0.23
Gesamt	100.00	

Spektrum 11 Atom %

C	35.78
O	3.51
Cu	59.82
Ag	0.38
Sn	0.29
Au	0.22
Gesamt	100.00

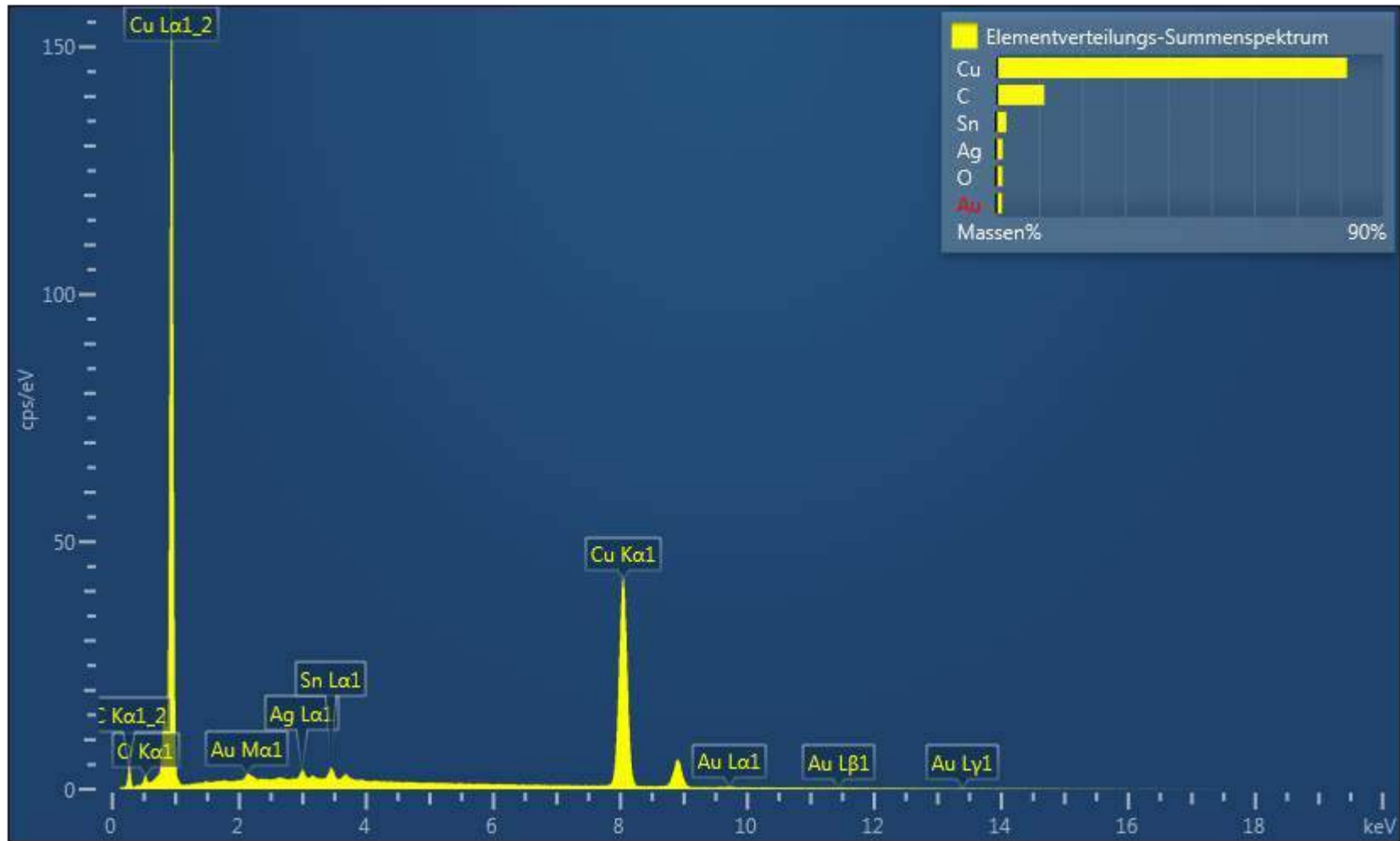
Elektronenbild 18





EDS-Überlagerungsbild 8



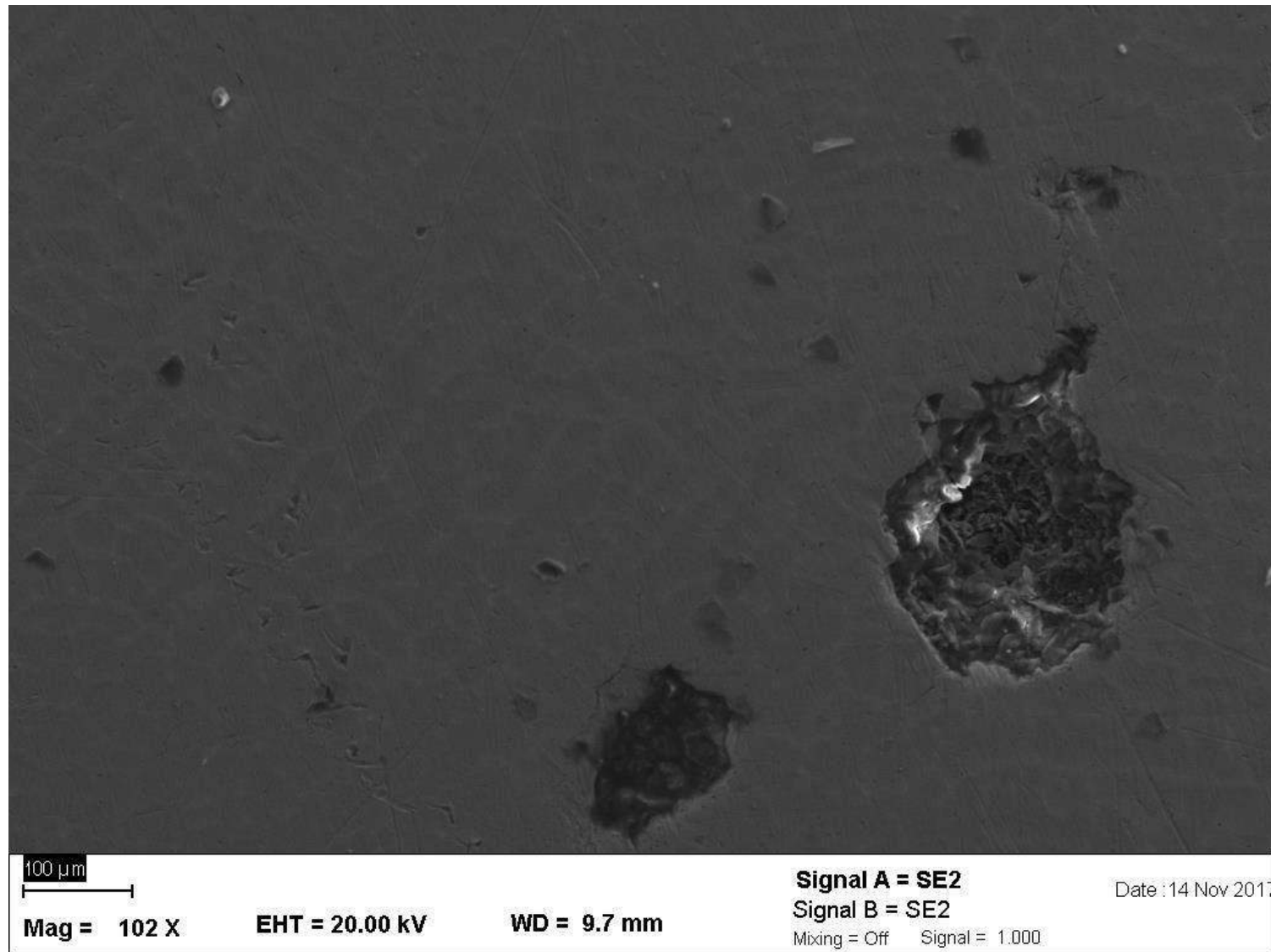


Elementverteilungs-Summenspektrum Atom %

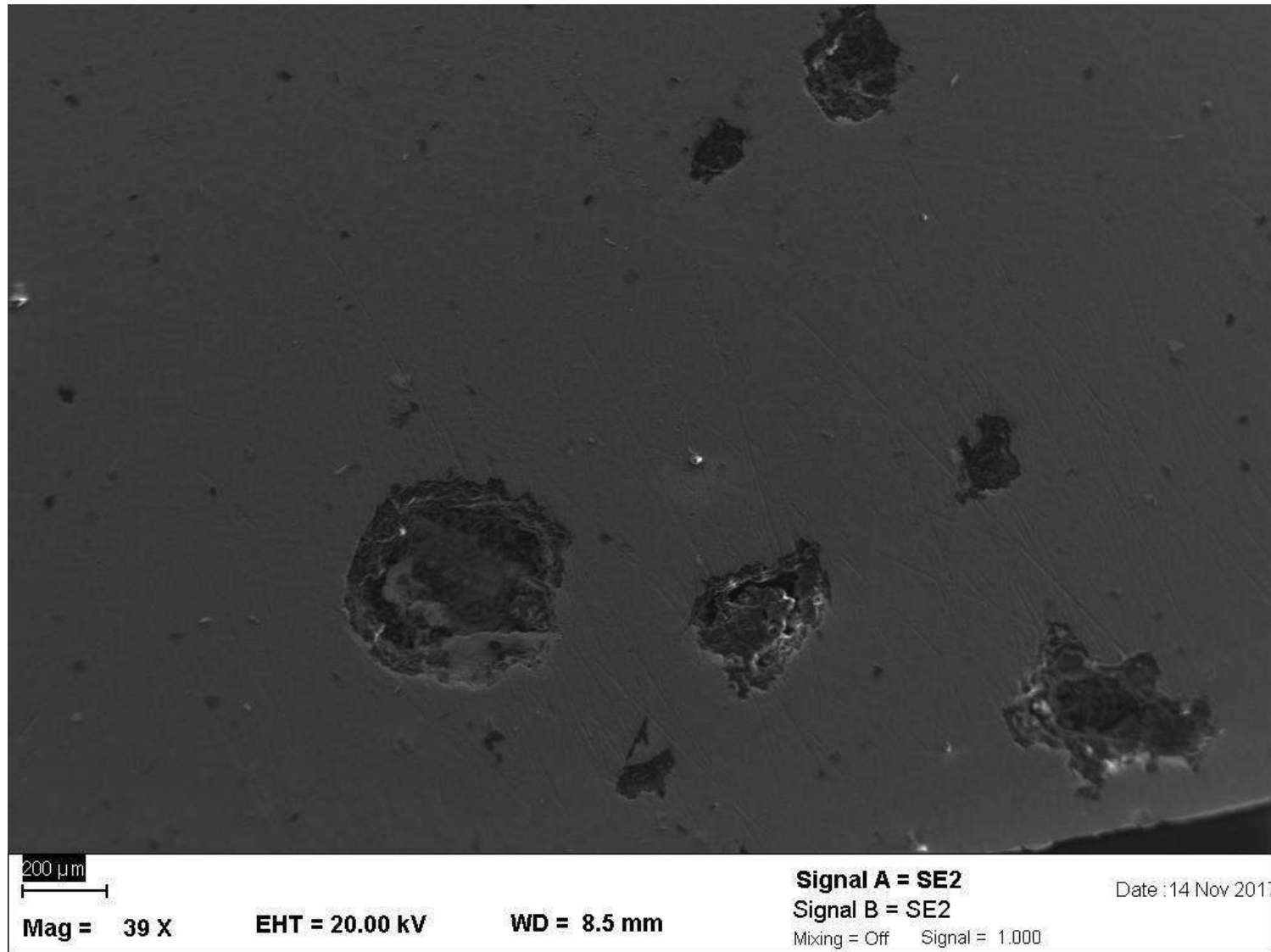
C	39.73
O	4.12
Cu	54.33
Ag	0.64
Sn	0.88
Au	0.31
Gesamt	100.00

Elementverteilungs-Summenspektrum Massen% Massen% Sigma

C	11.28	0.31
O	1.56	0.10
Cu	81.63	0.34
Ag	1.62	0.09
Sn	2.48	0.09
Au	1.43	0.15
Gesamt	100.00	

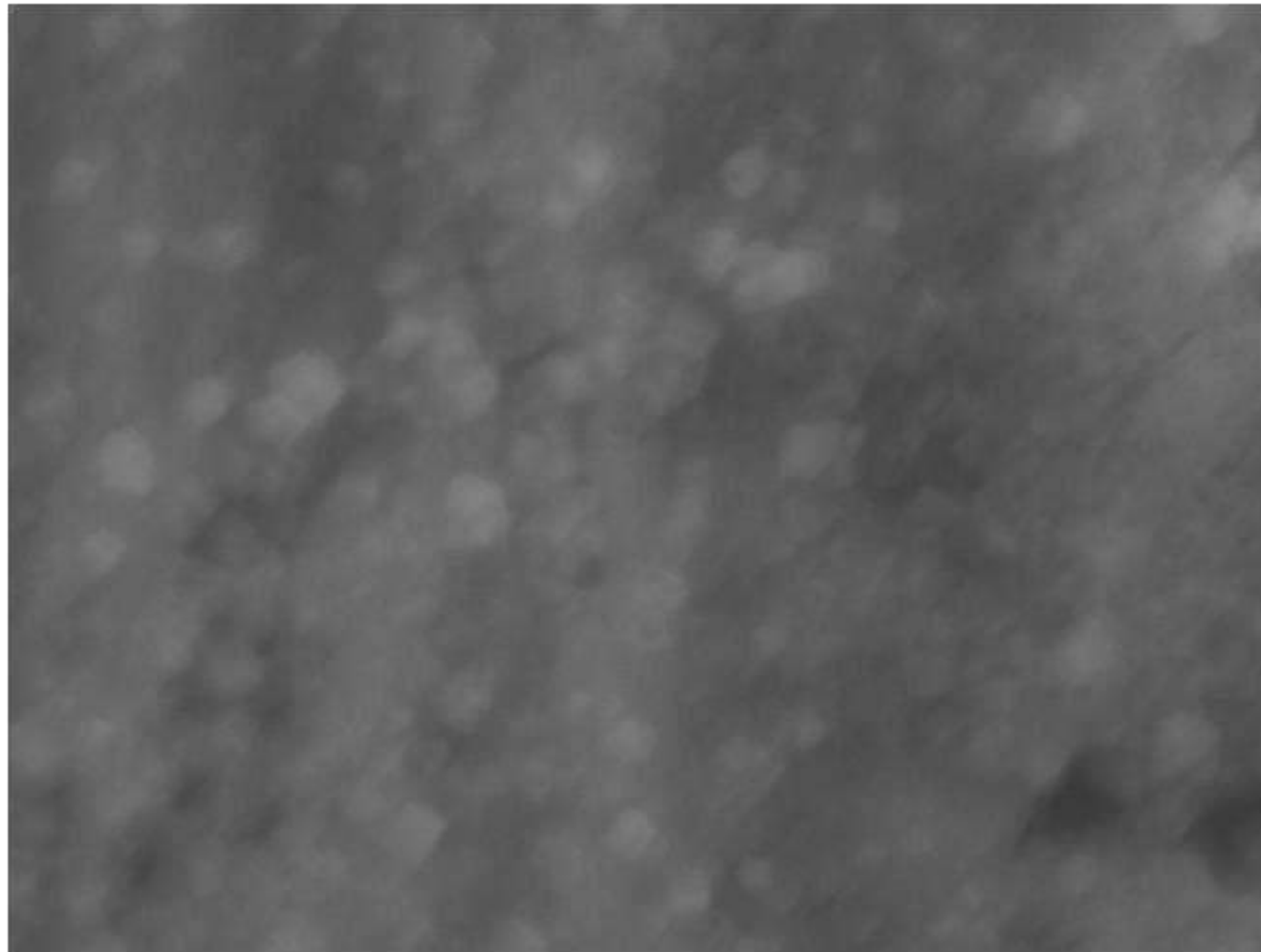


SEM image of Alloy 5a1- Exp. 25. Sweaty hands (no cuprite observed. Flat secretions are mostly carbon).



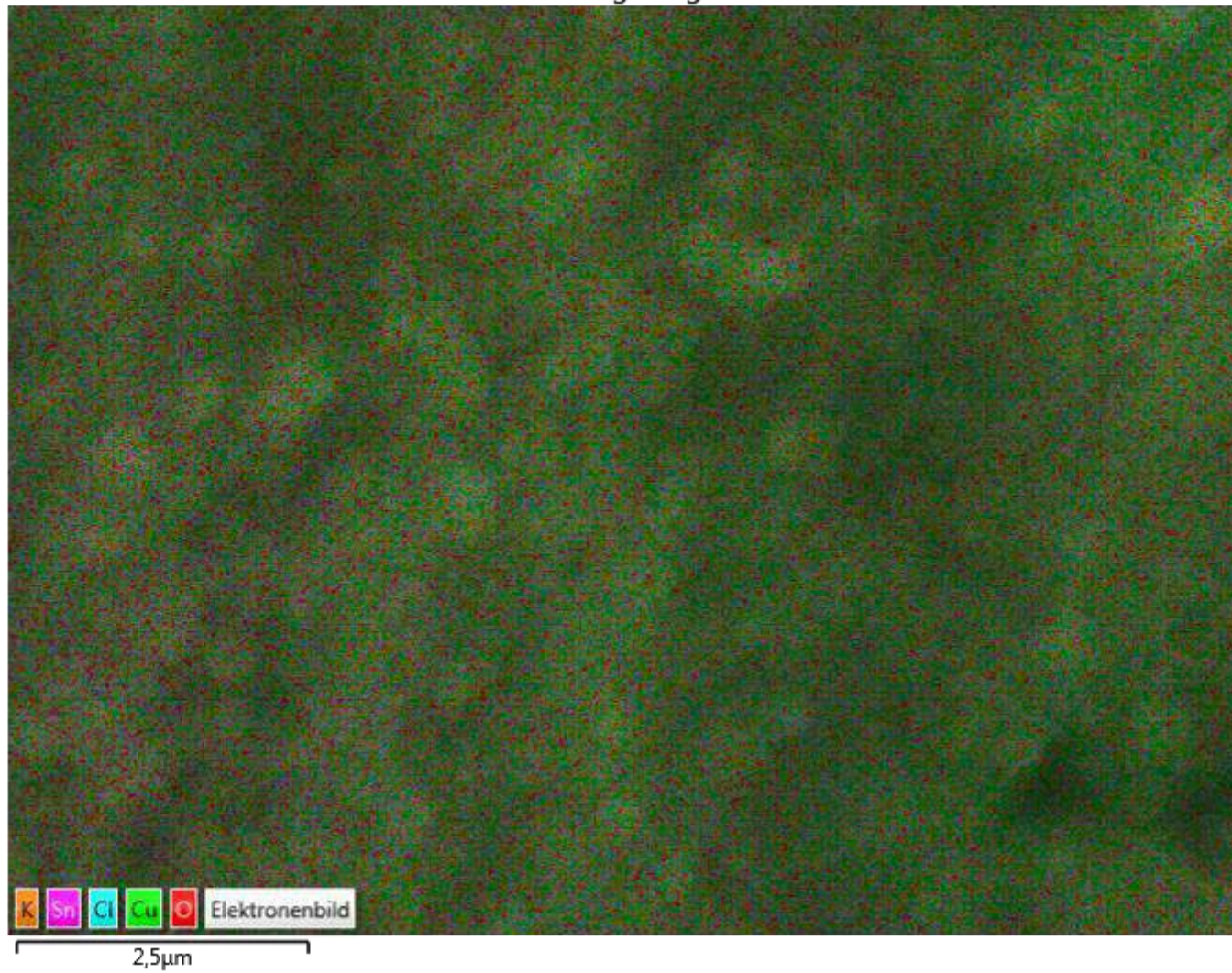
SEM image of alloy 5a1, Exp. 25. Sweaty hands (2017). No cuprite observed.

Elektronenbild 1

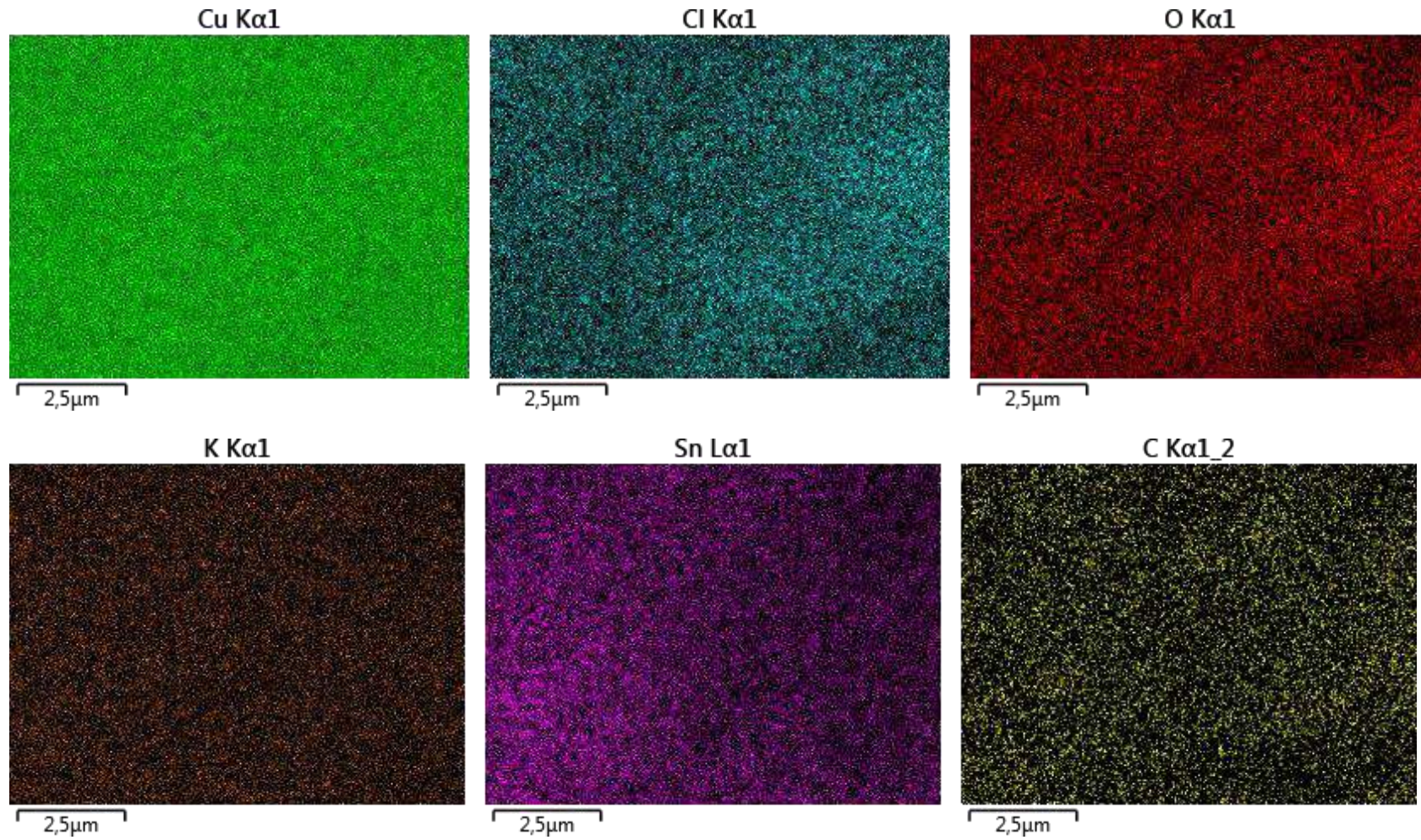


2,5µm

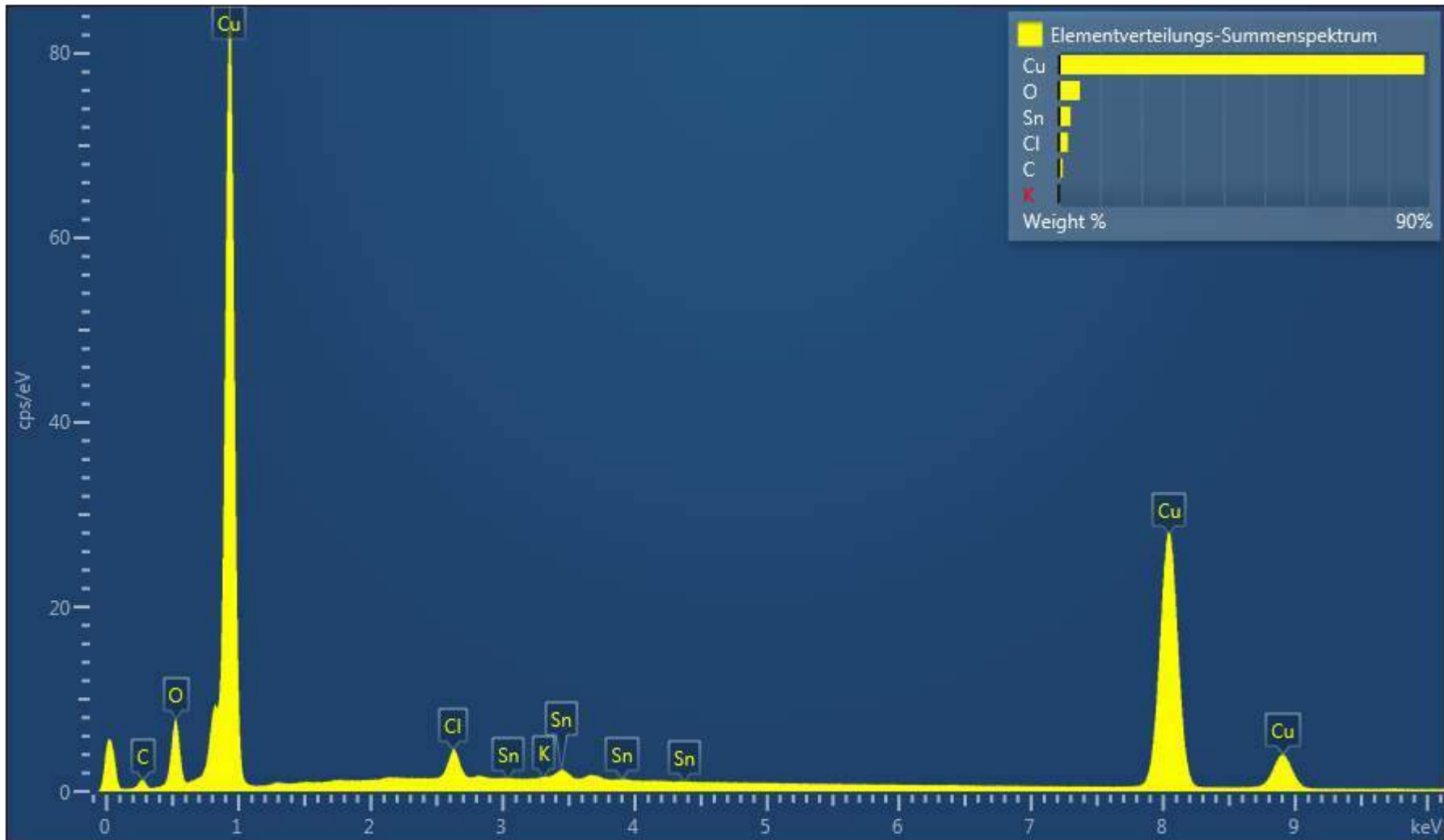
EDS-Überlagerungsbild 1

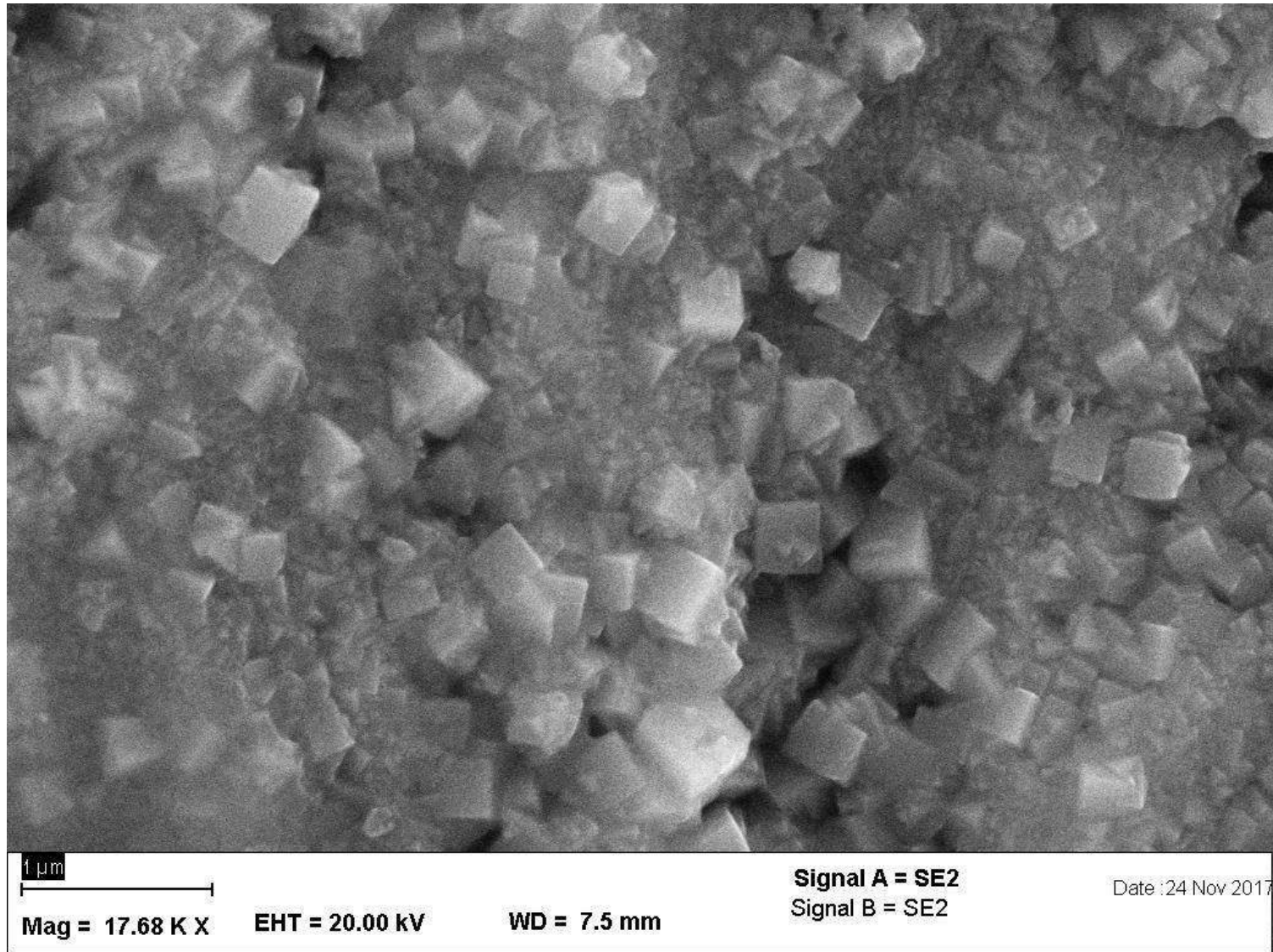


The number in brackets refers to a different analysis position on the same sample



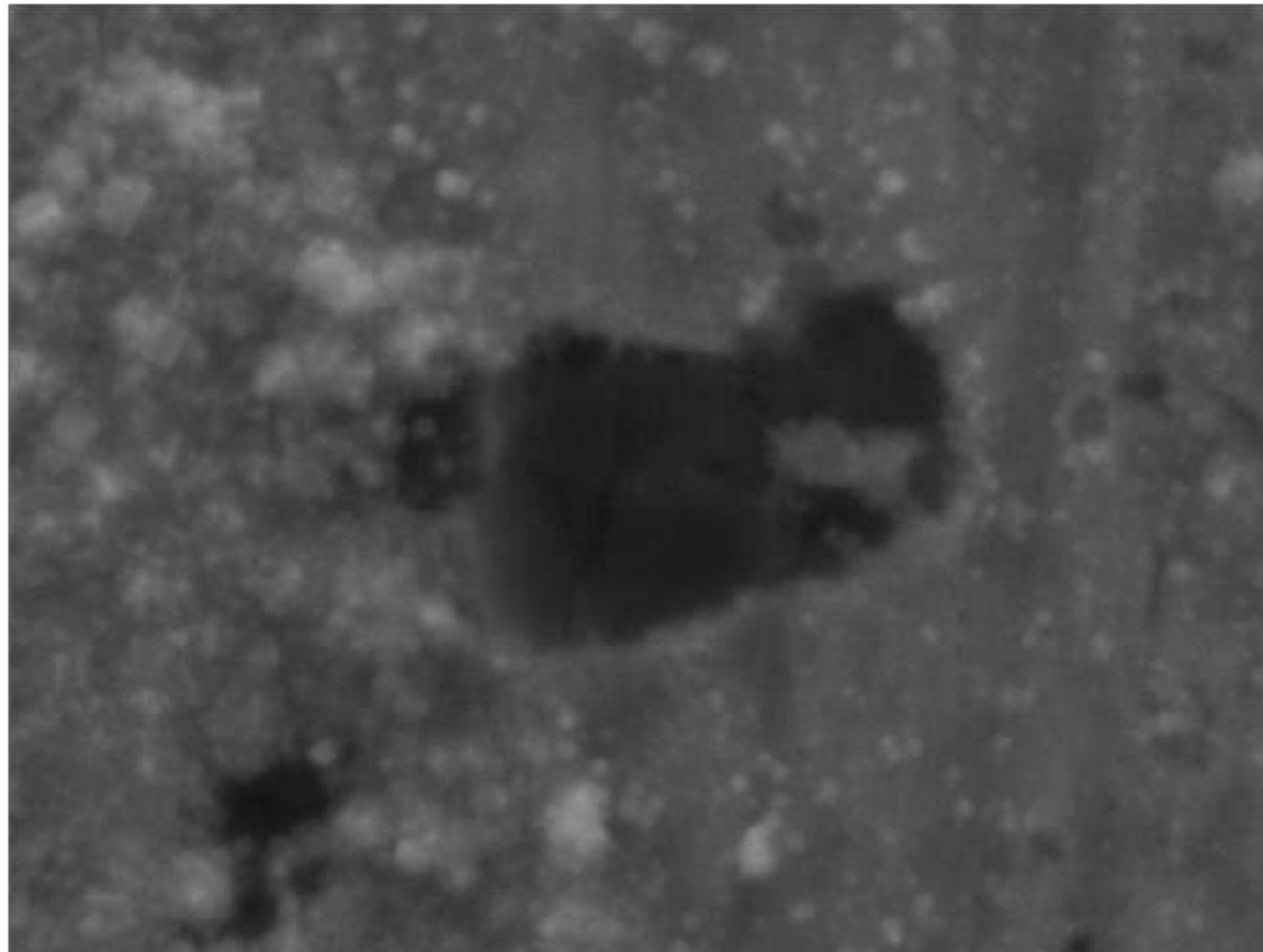
The number in brackets refers to a different analysis position on the same sample





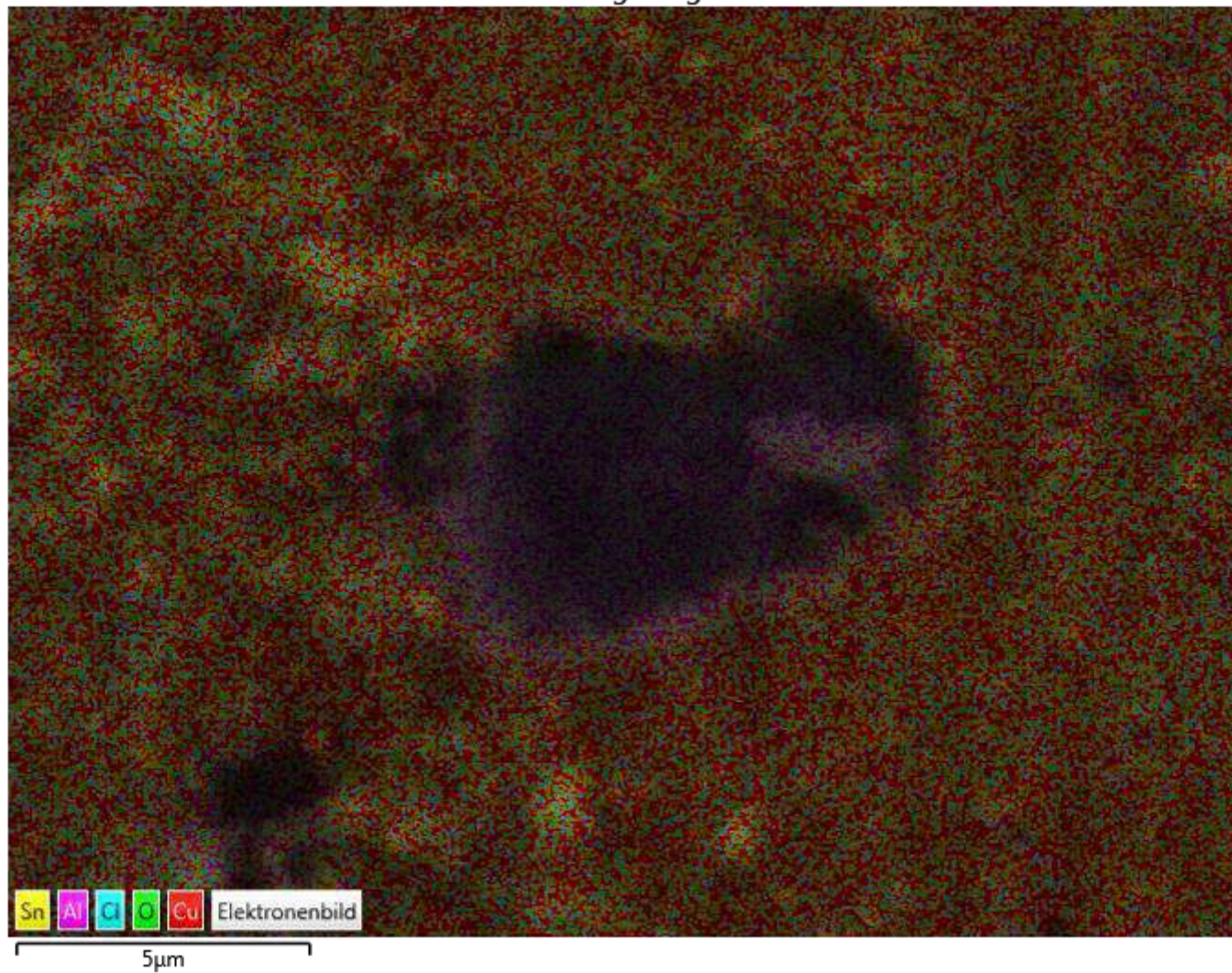
SEM Image of Alloy 1a1 - Niiro (Exp. 22)

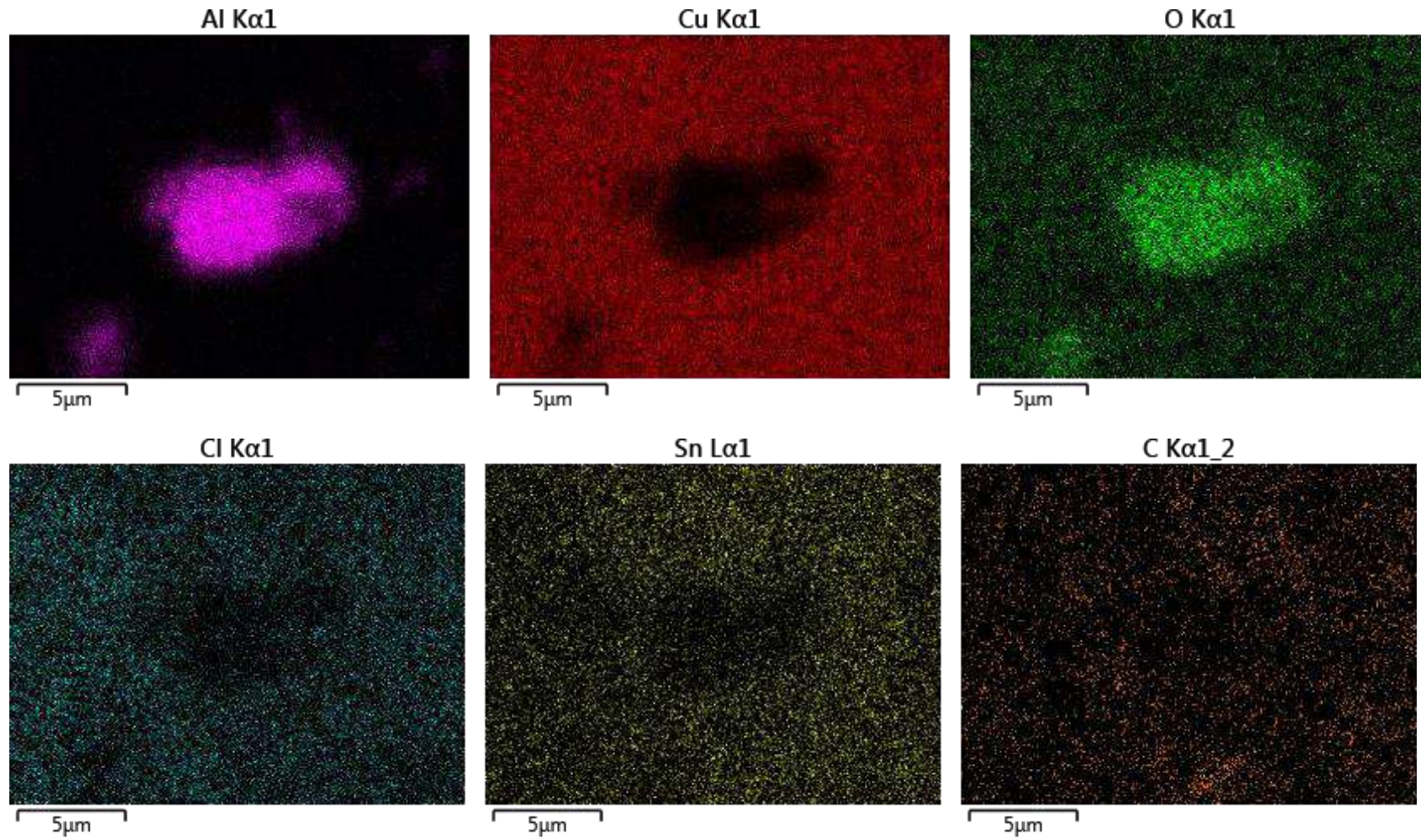
Elektronenbild 2

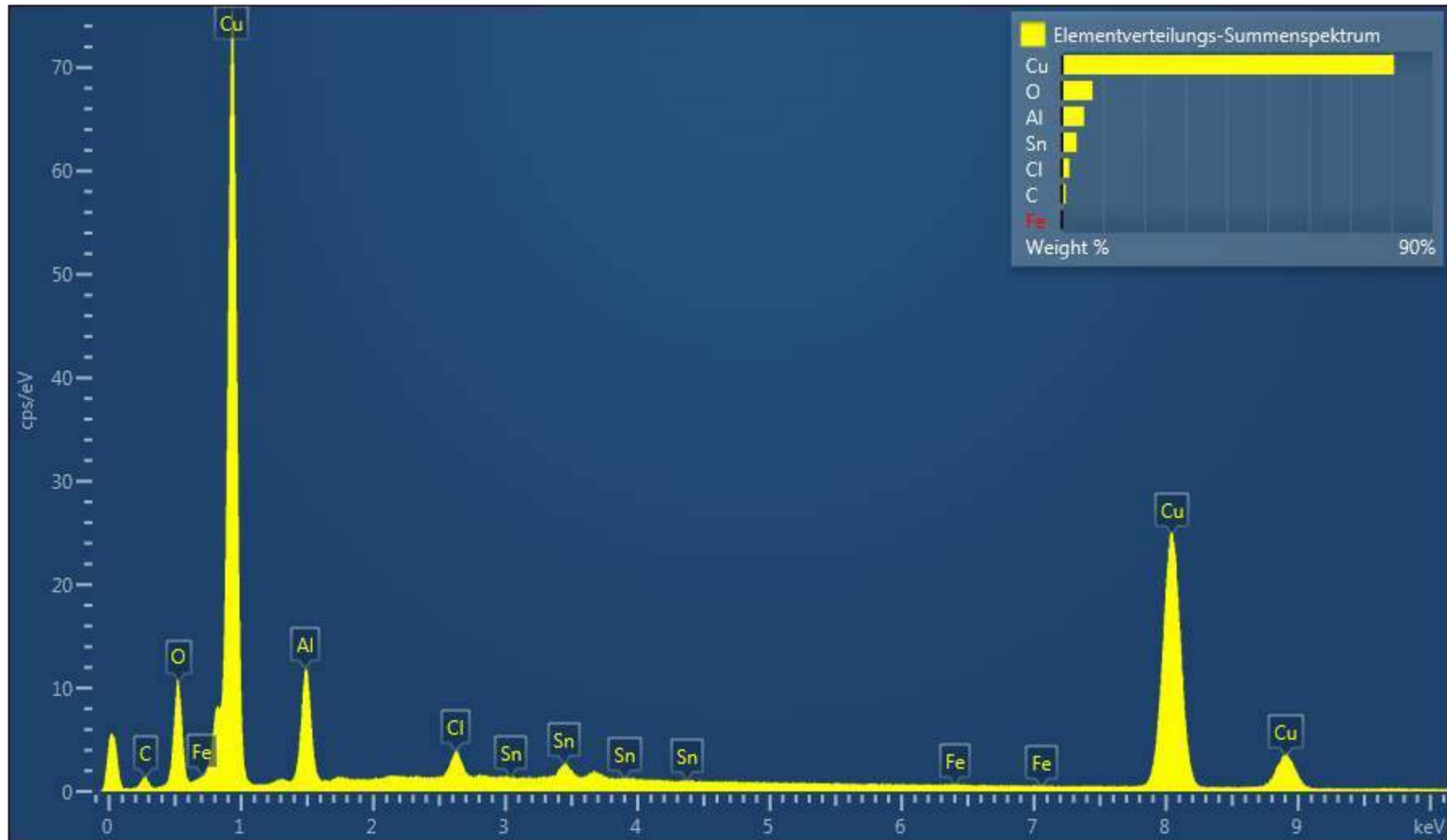


5µm

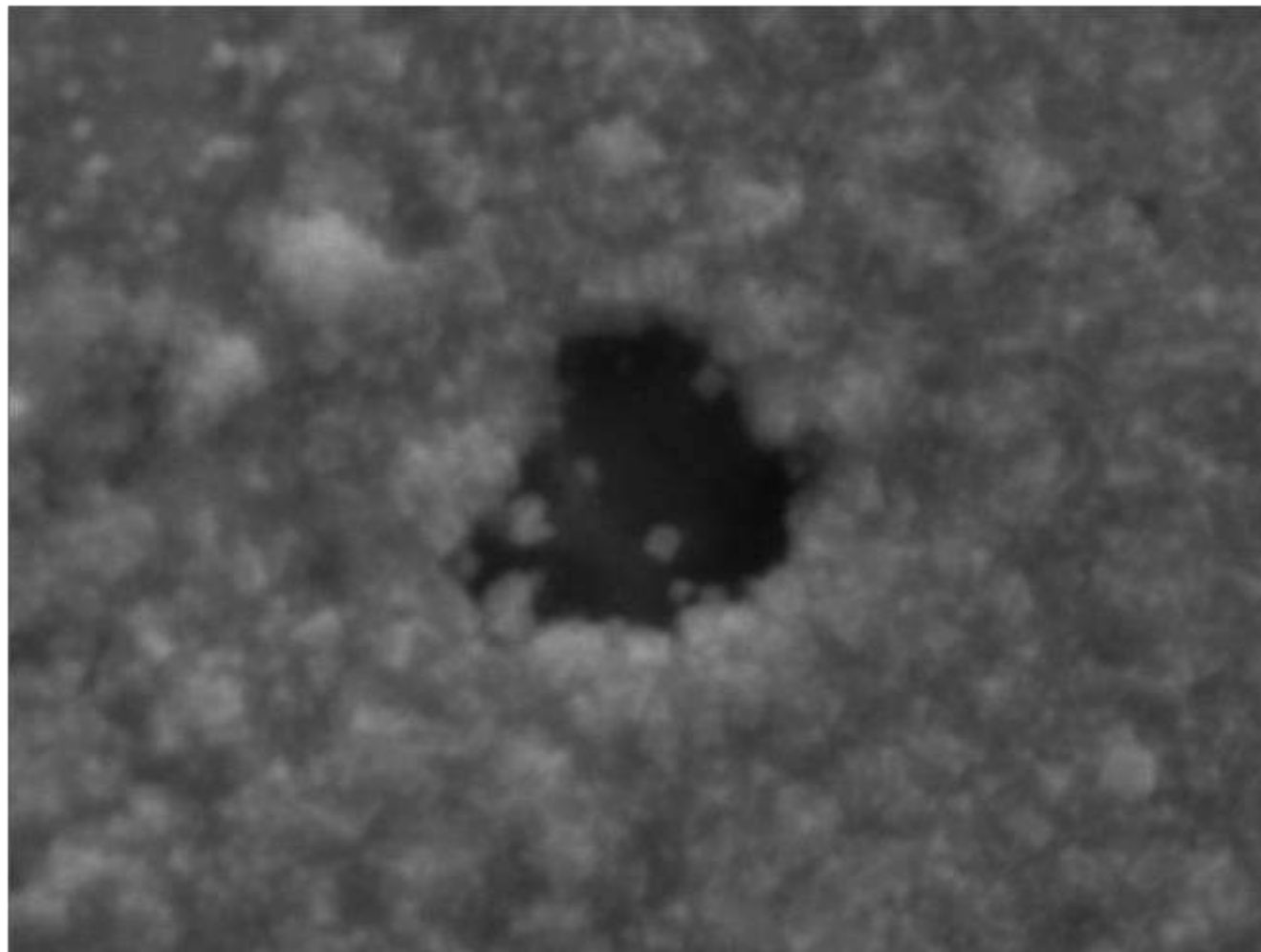
EDS-Überlagerungsbild 2





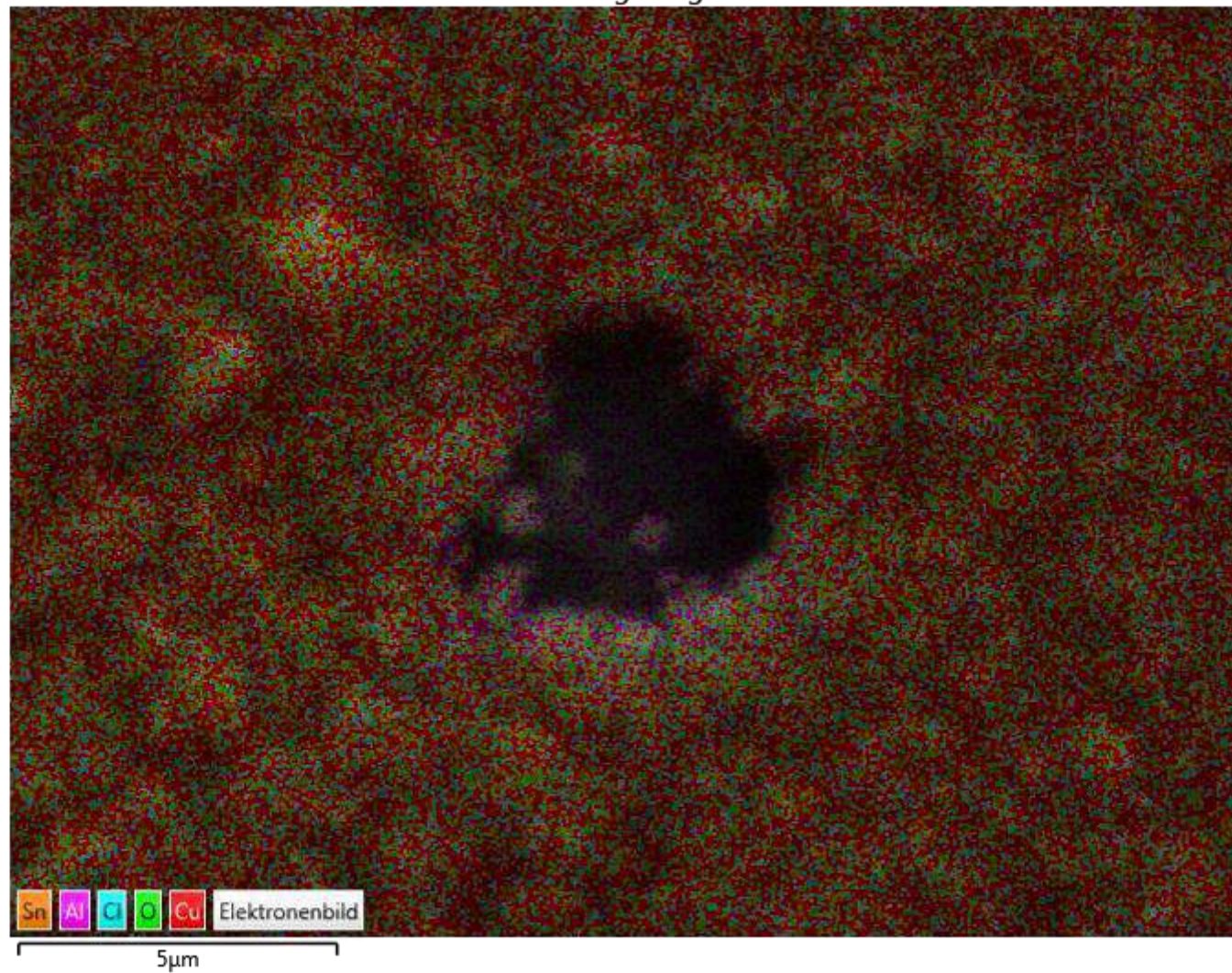


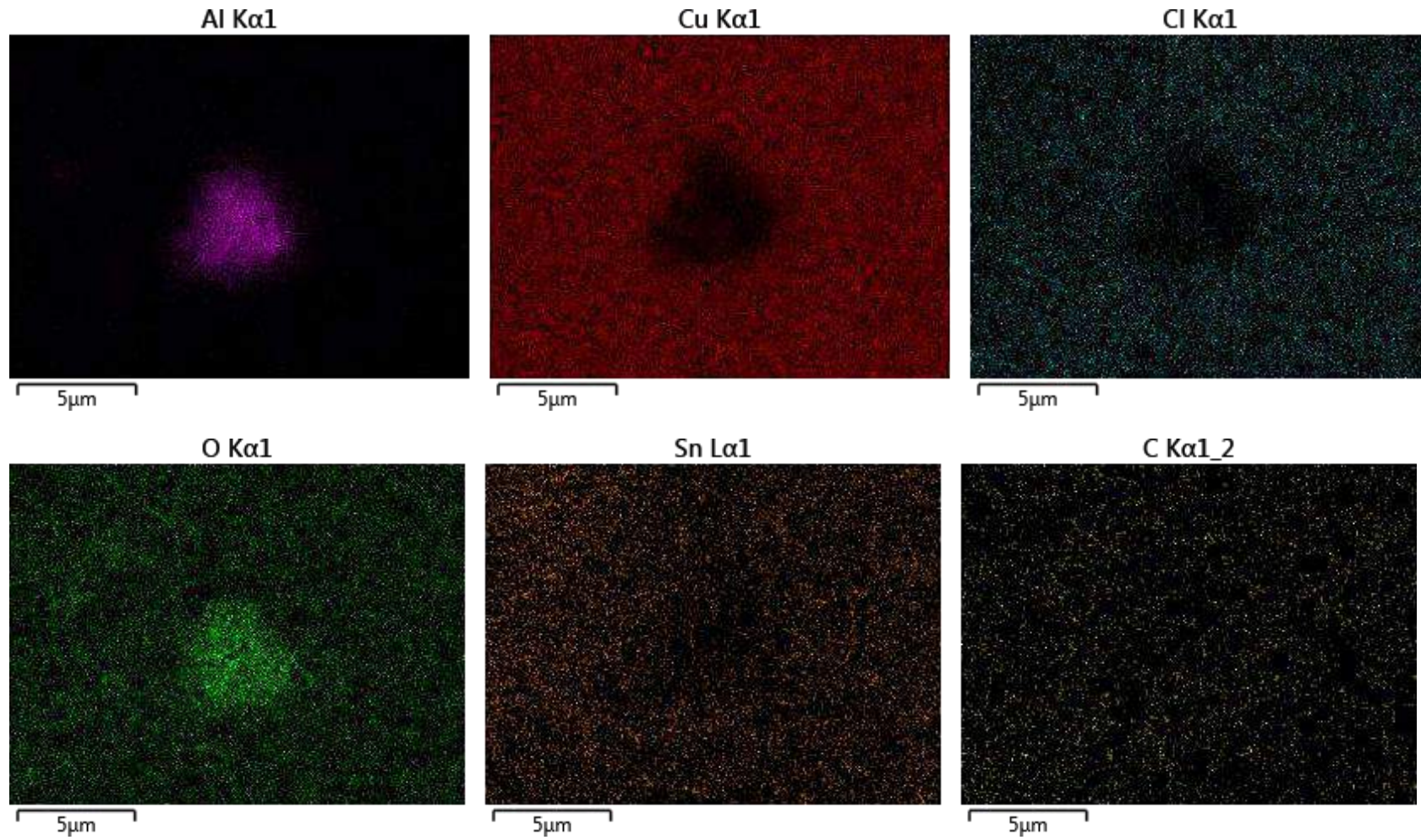
Elektronenbild 3

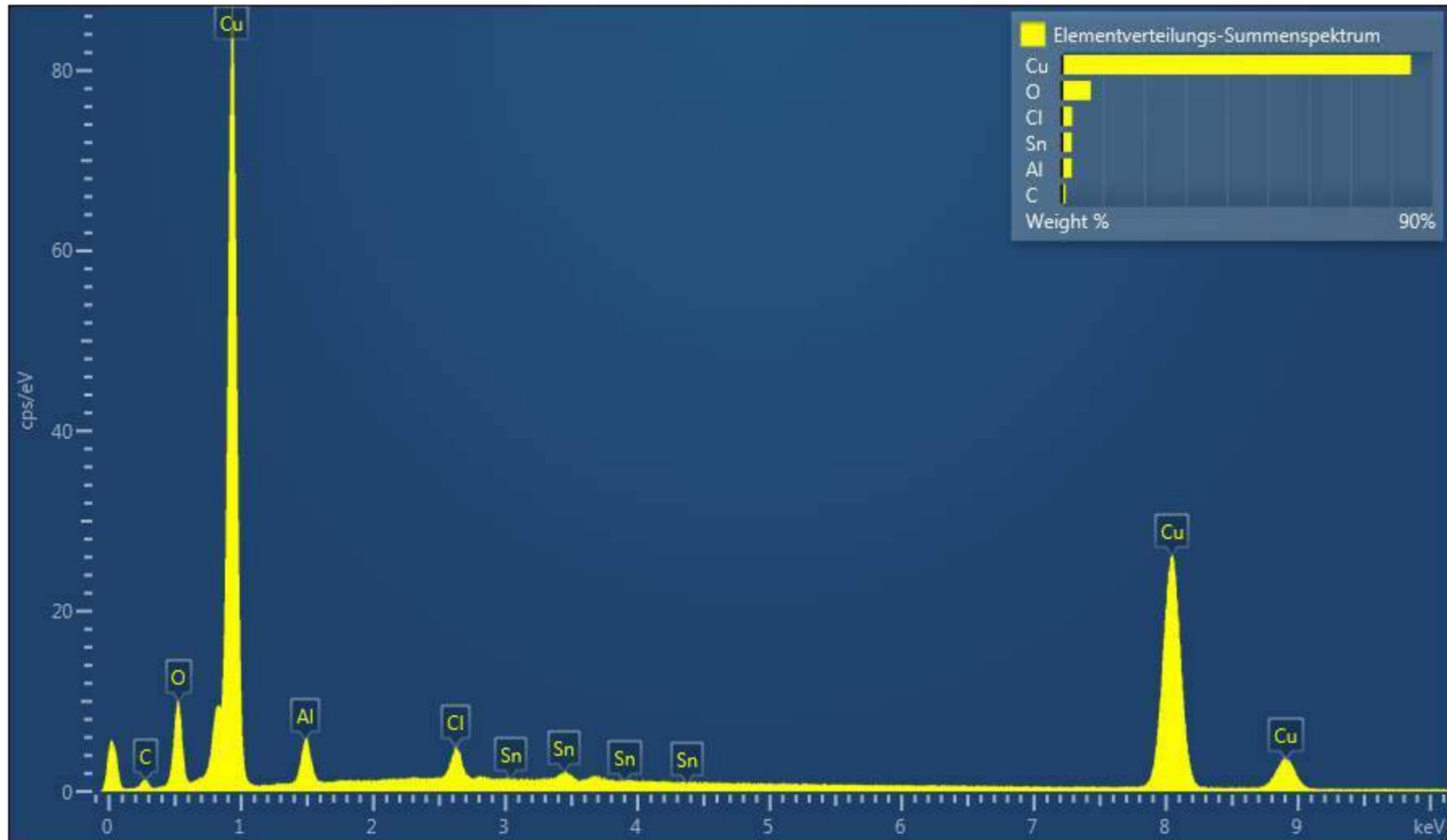


5µm

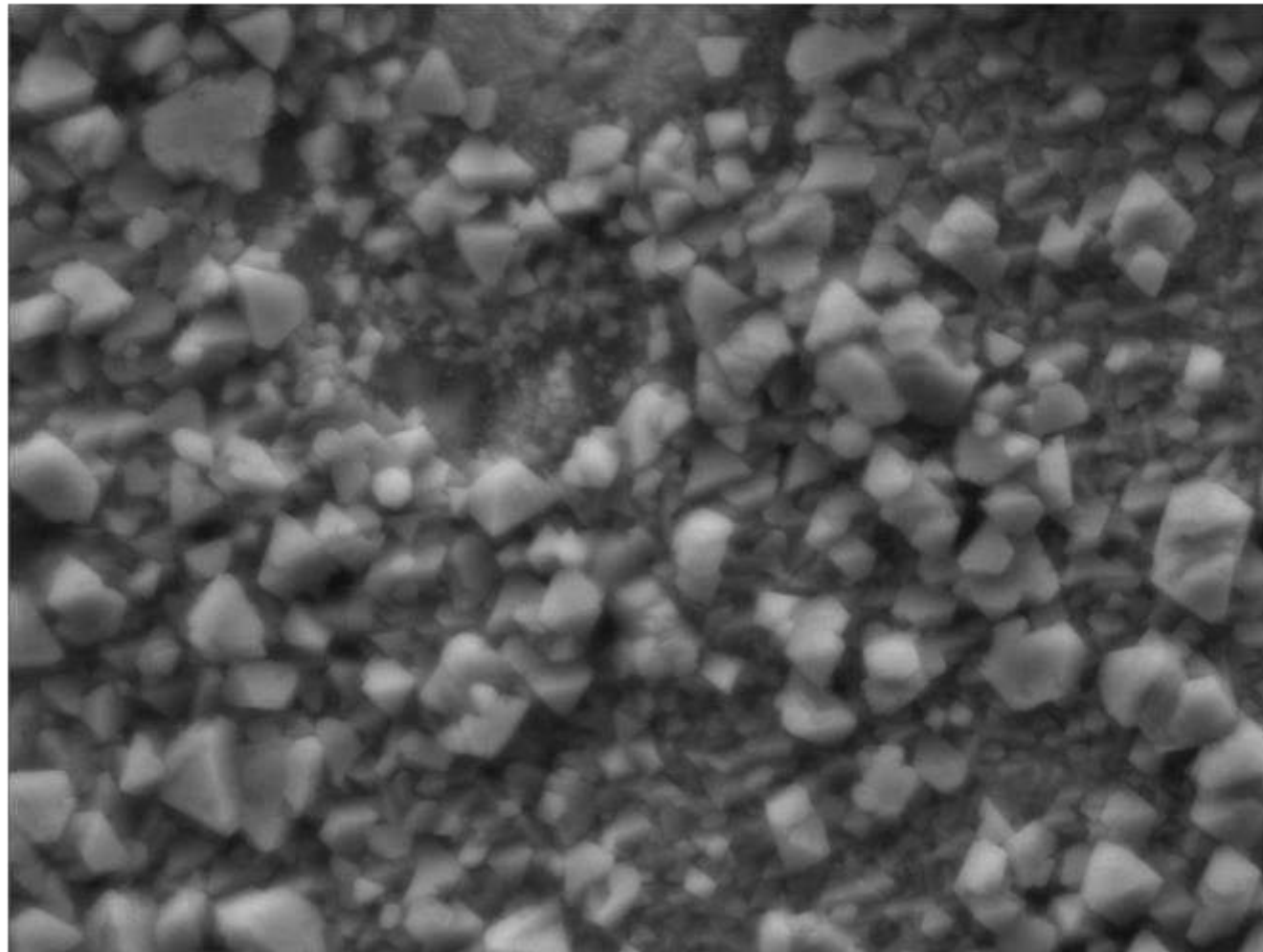
EDS-Überlagerungsbild 3





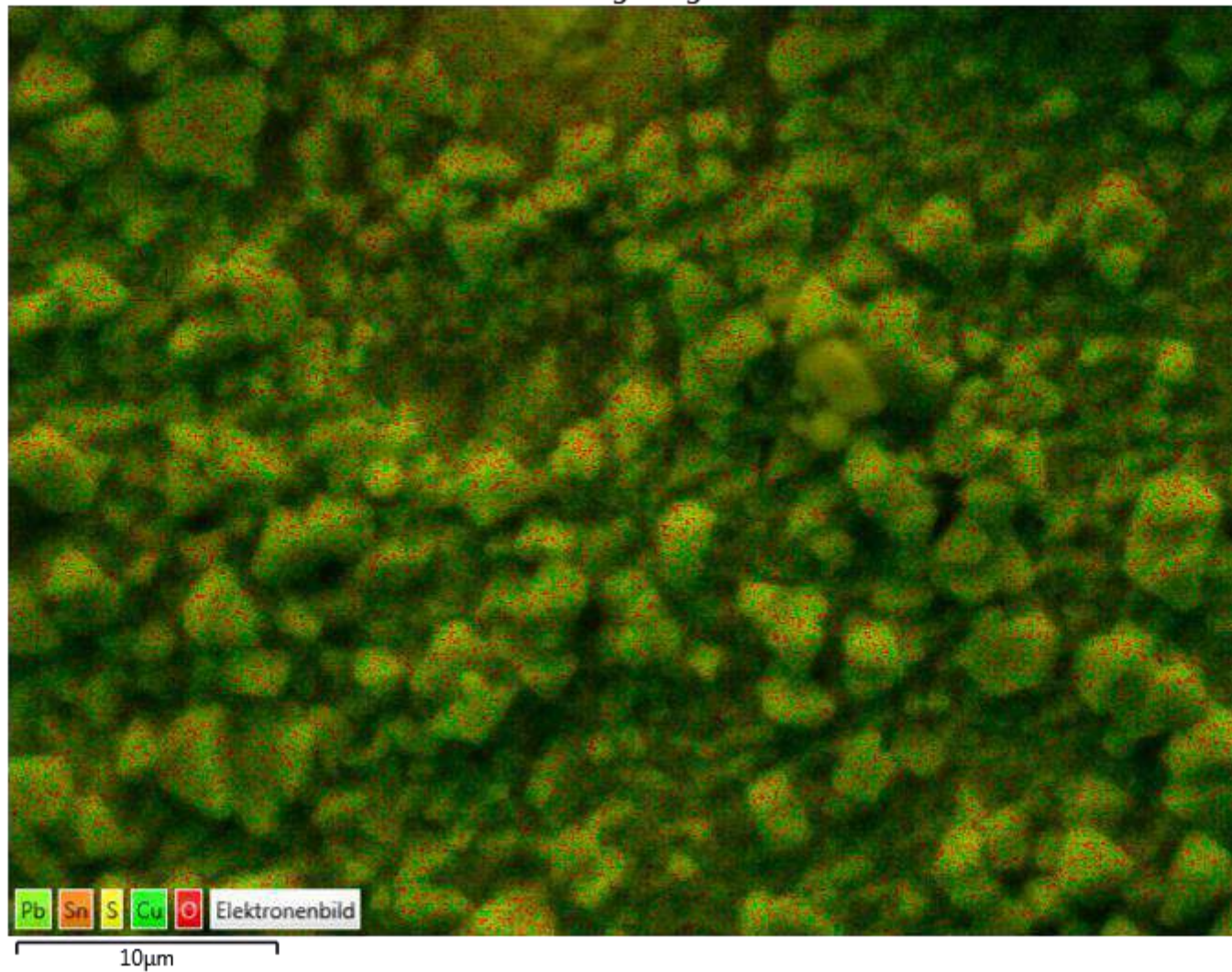


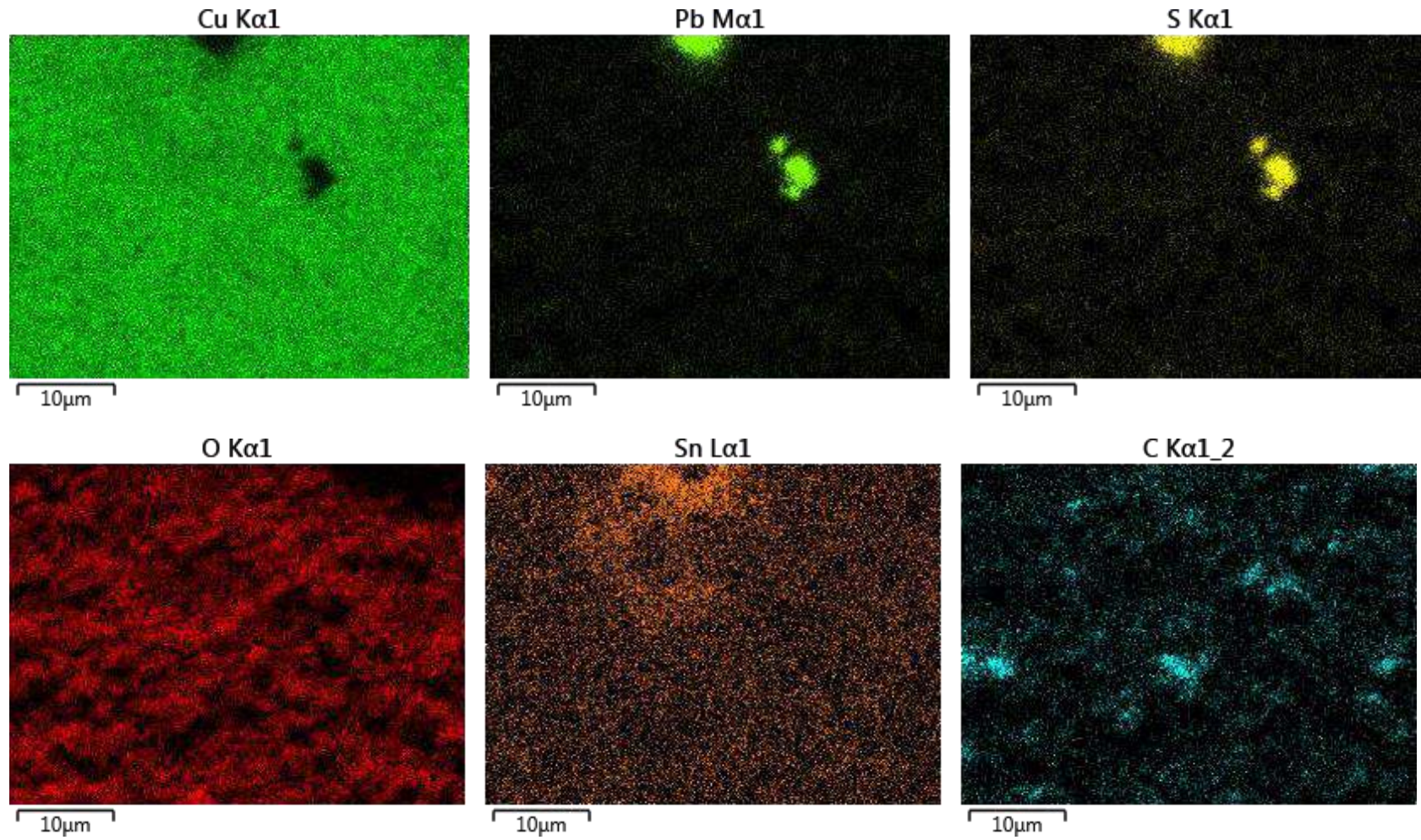
Elektronenbild 4



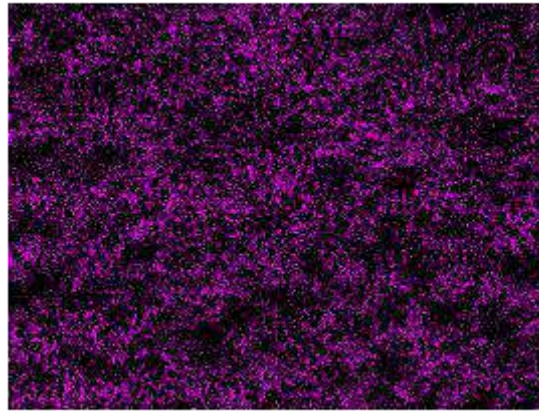
10µm

EDS-Überlagerungsbild 4



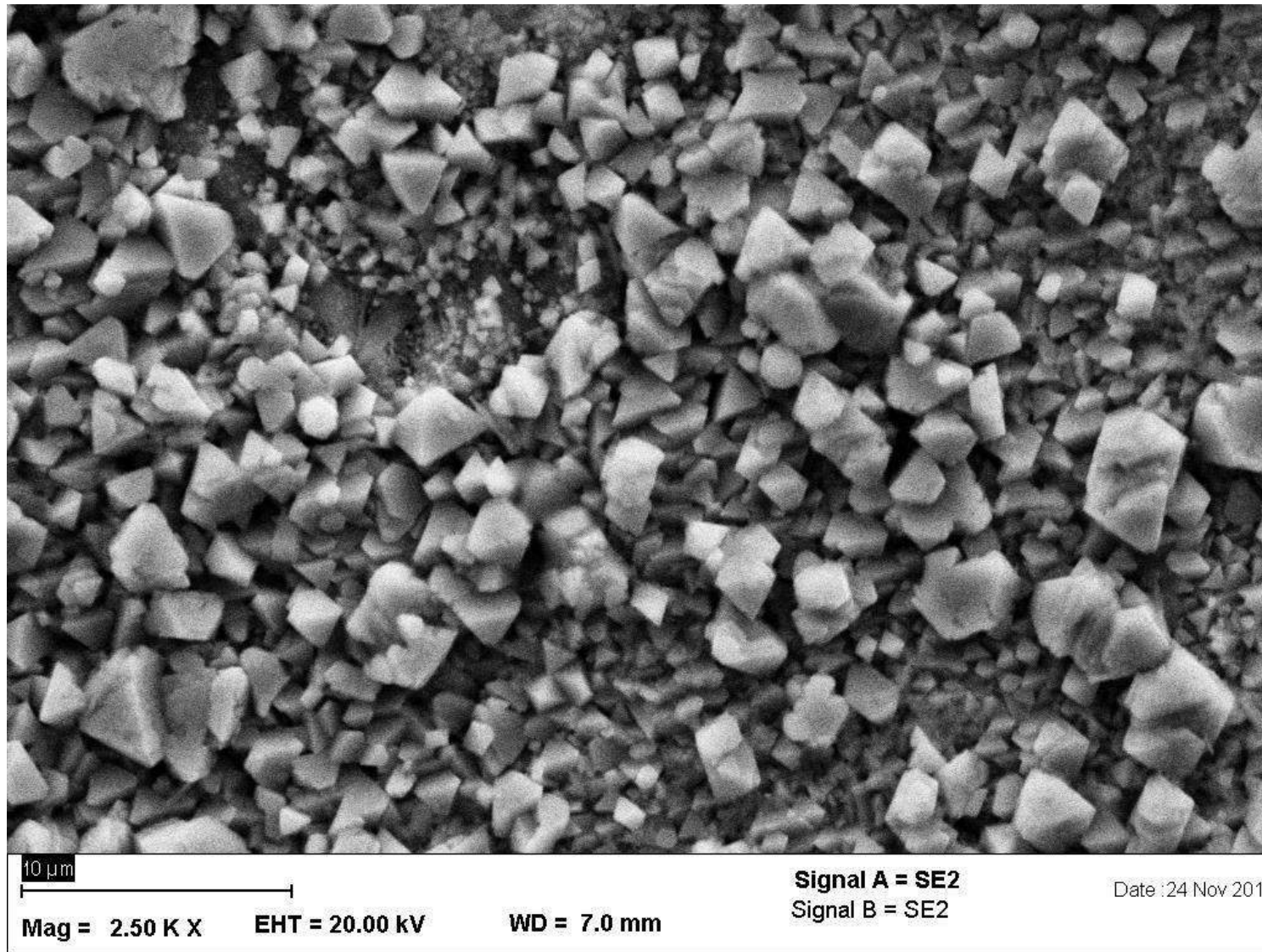


Al K α 1

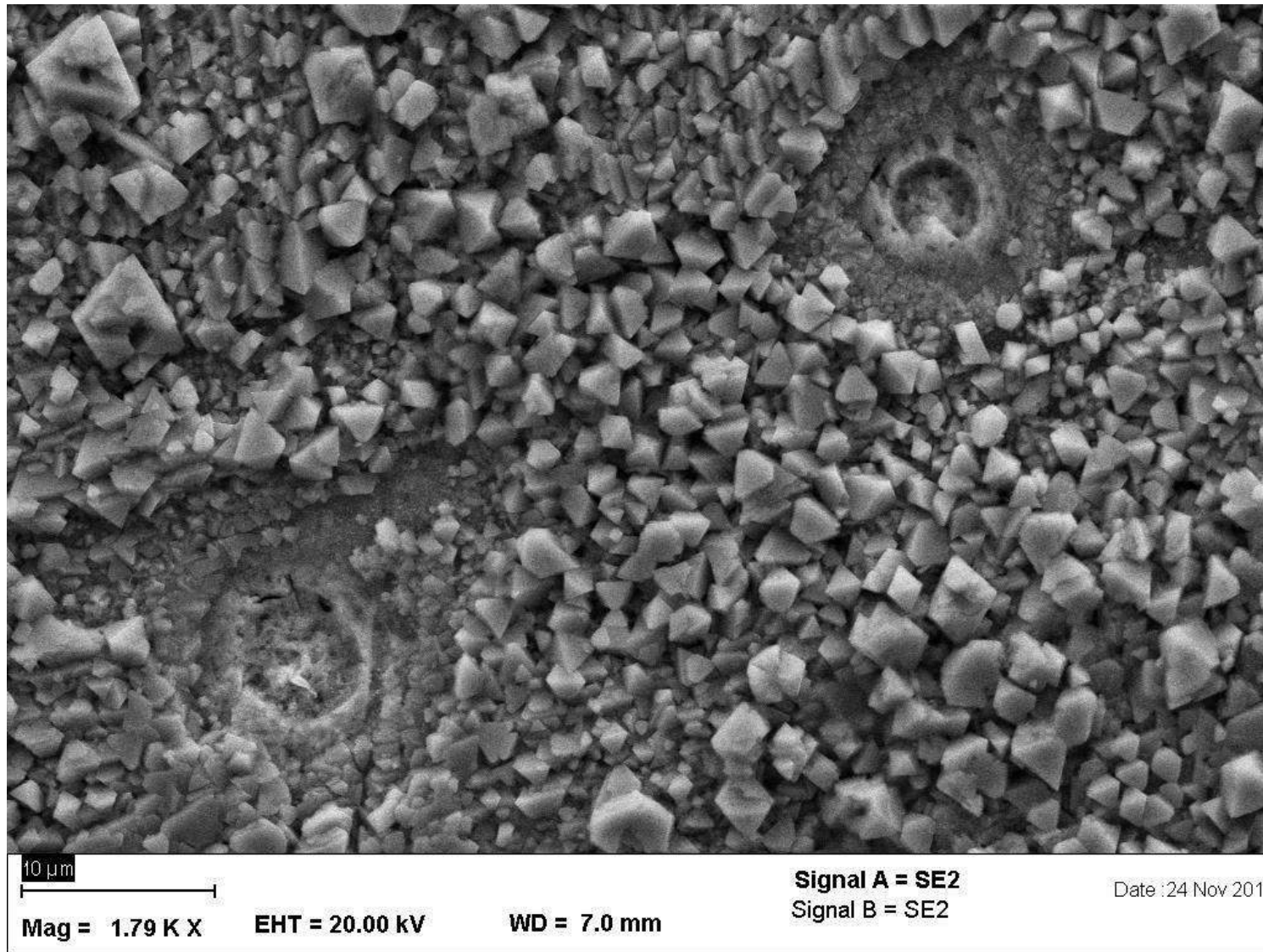


10 μ m

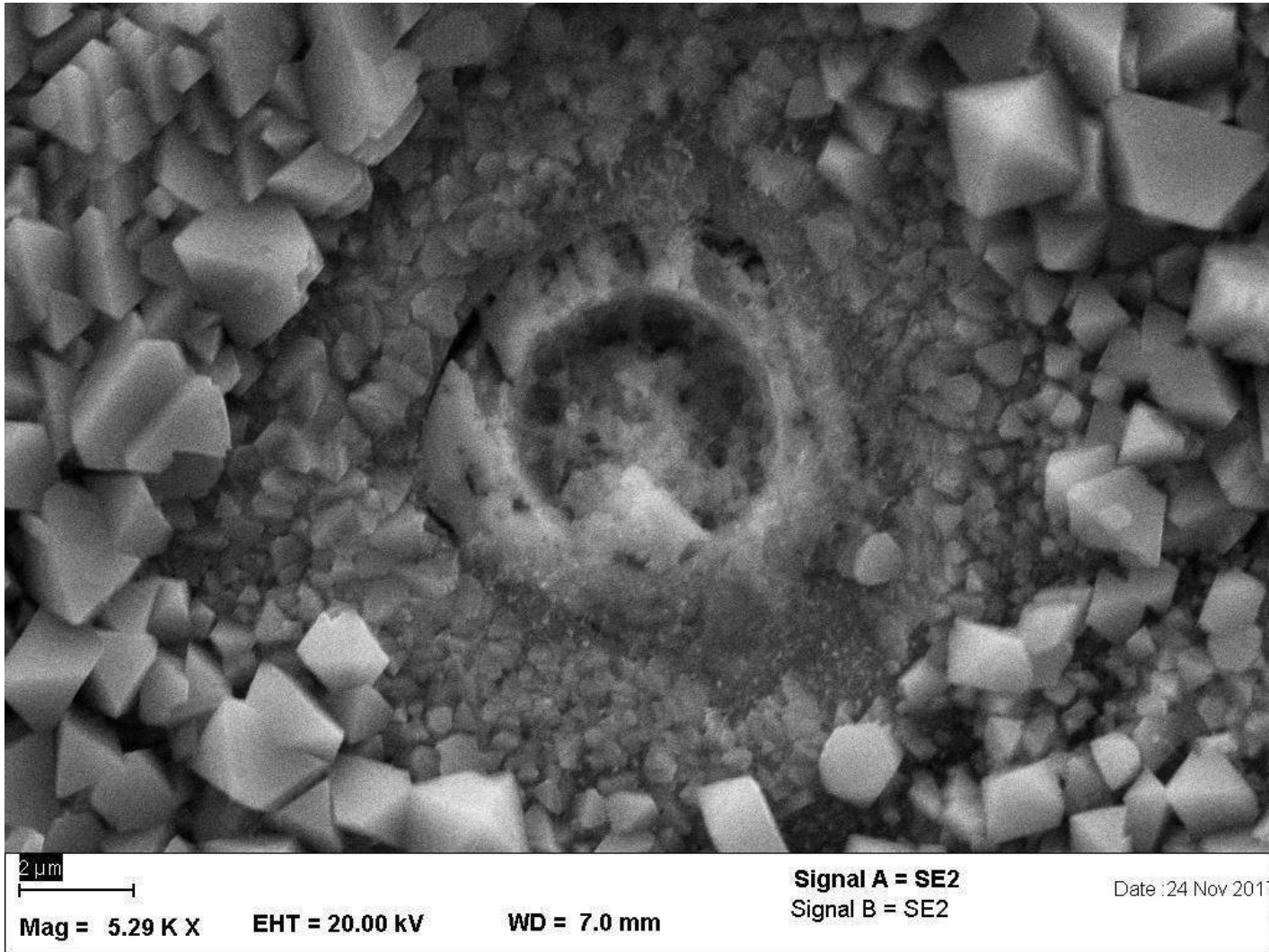




SEM image of Alloy 1a1 – Nikomi Chakusoku – Exp.2

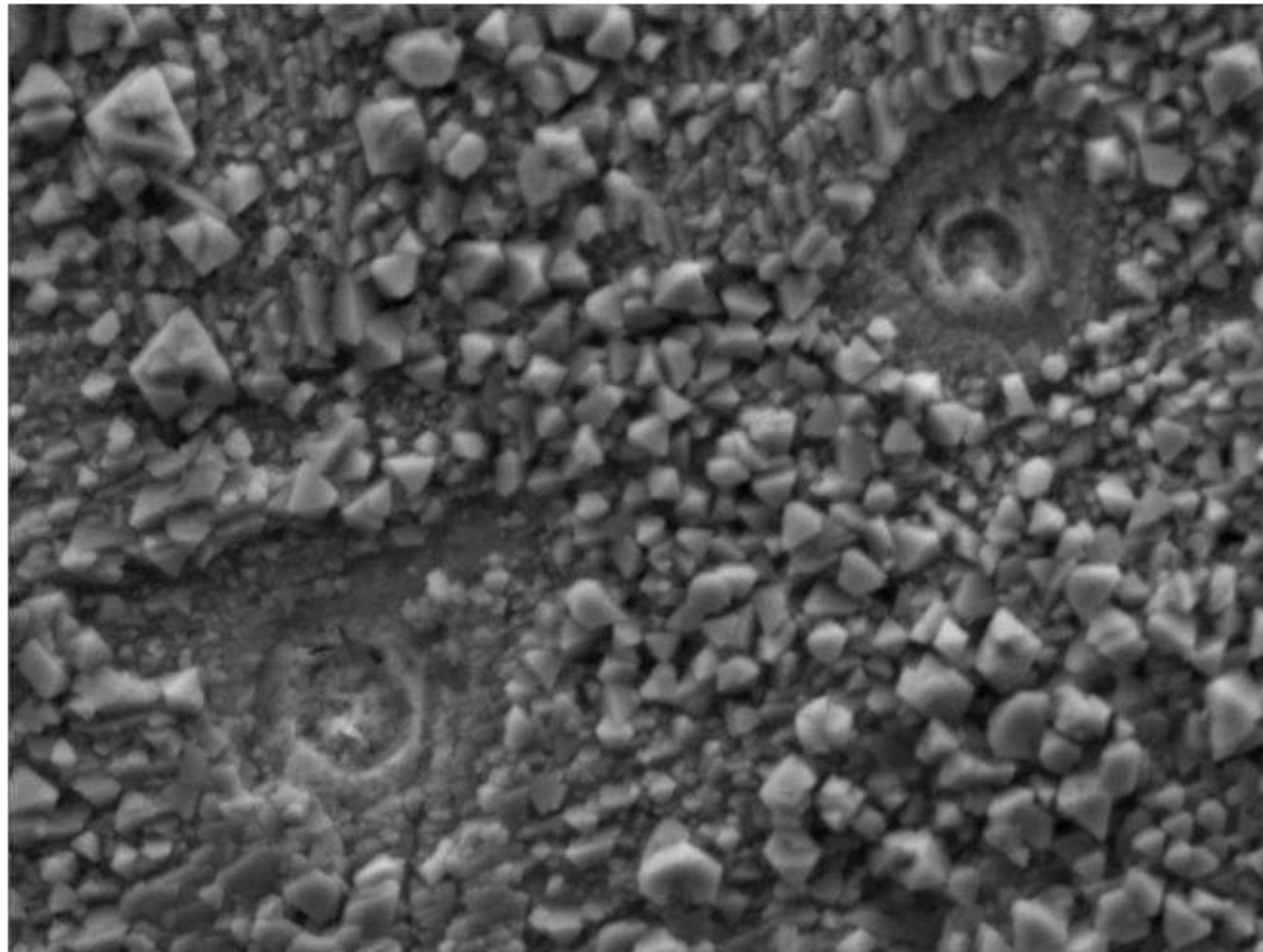


SEM image of Alloy 1a1 – Nikomi Chakusoku – Exp.2



SEM image of Alloy 1a1 – Nikomi Chakusoku – Exp.2

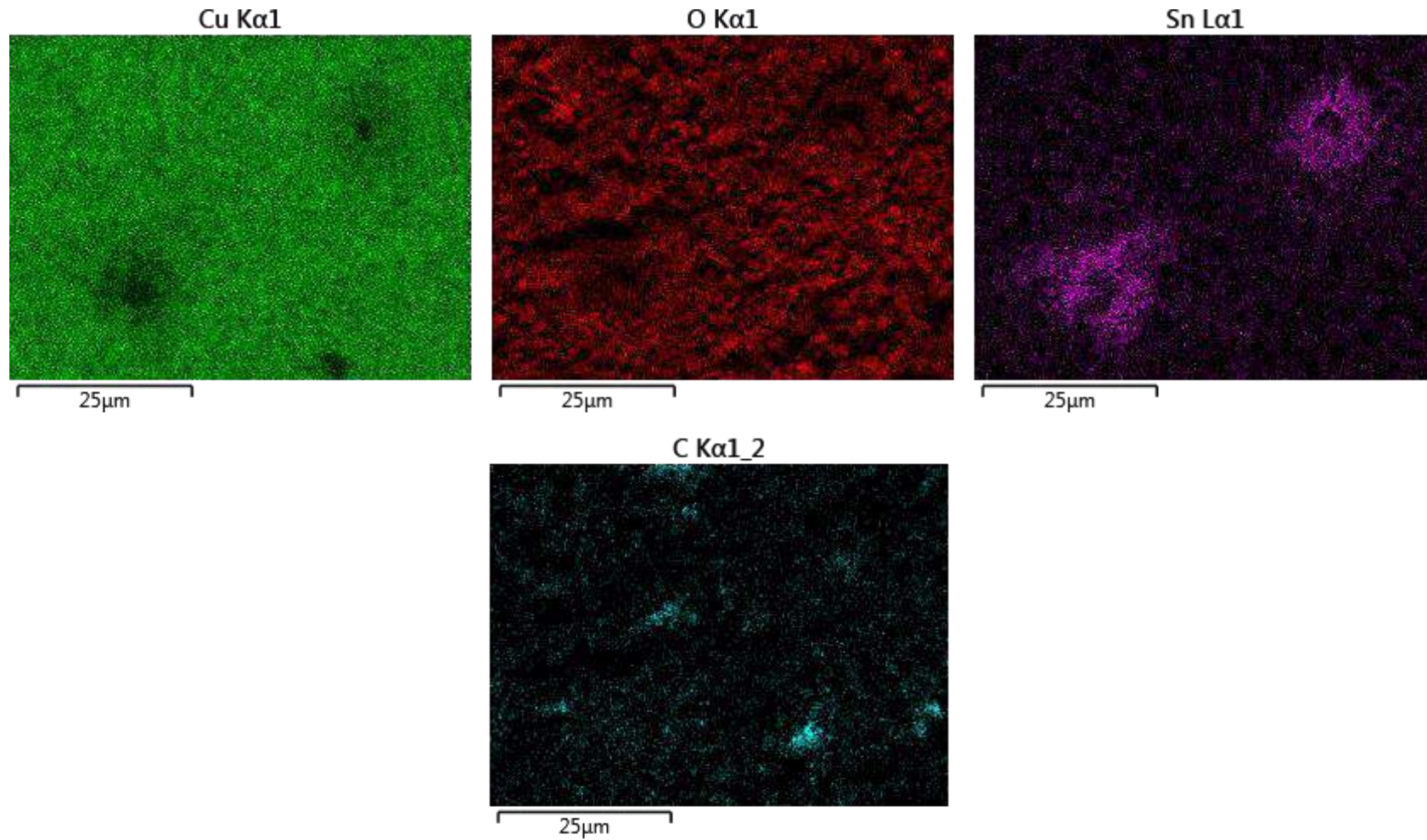
Elektronenbild 5

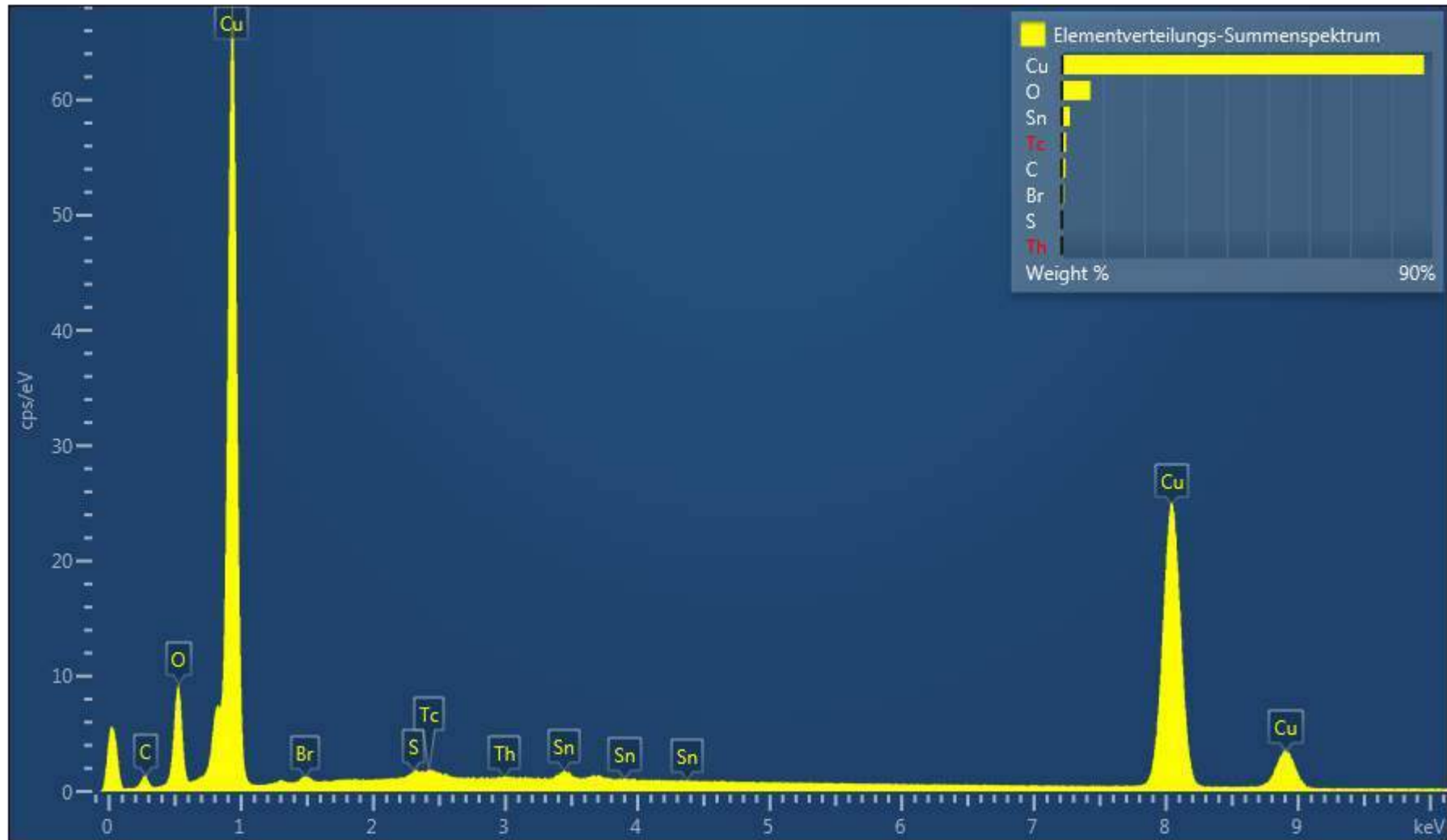


25µm

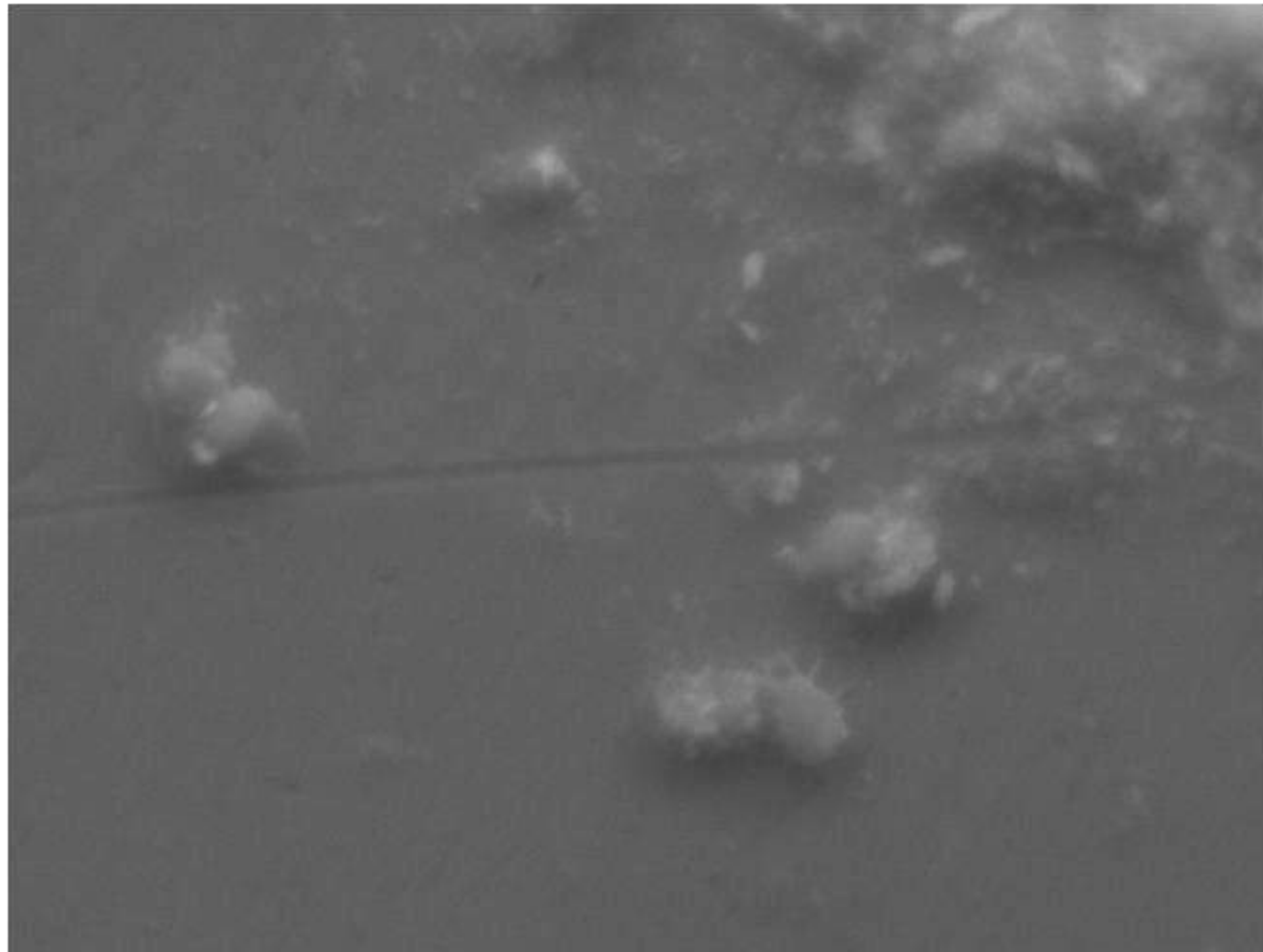
EDS-Überlagerungsbild 5







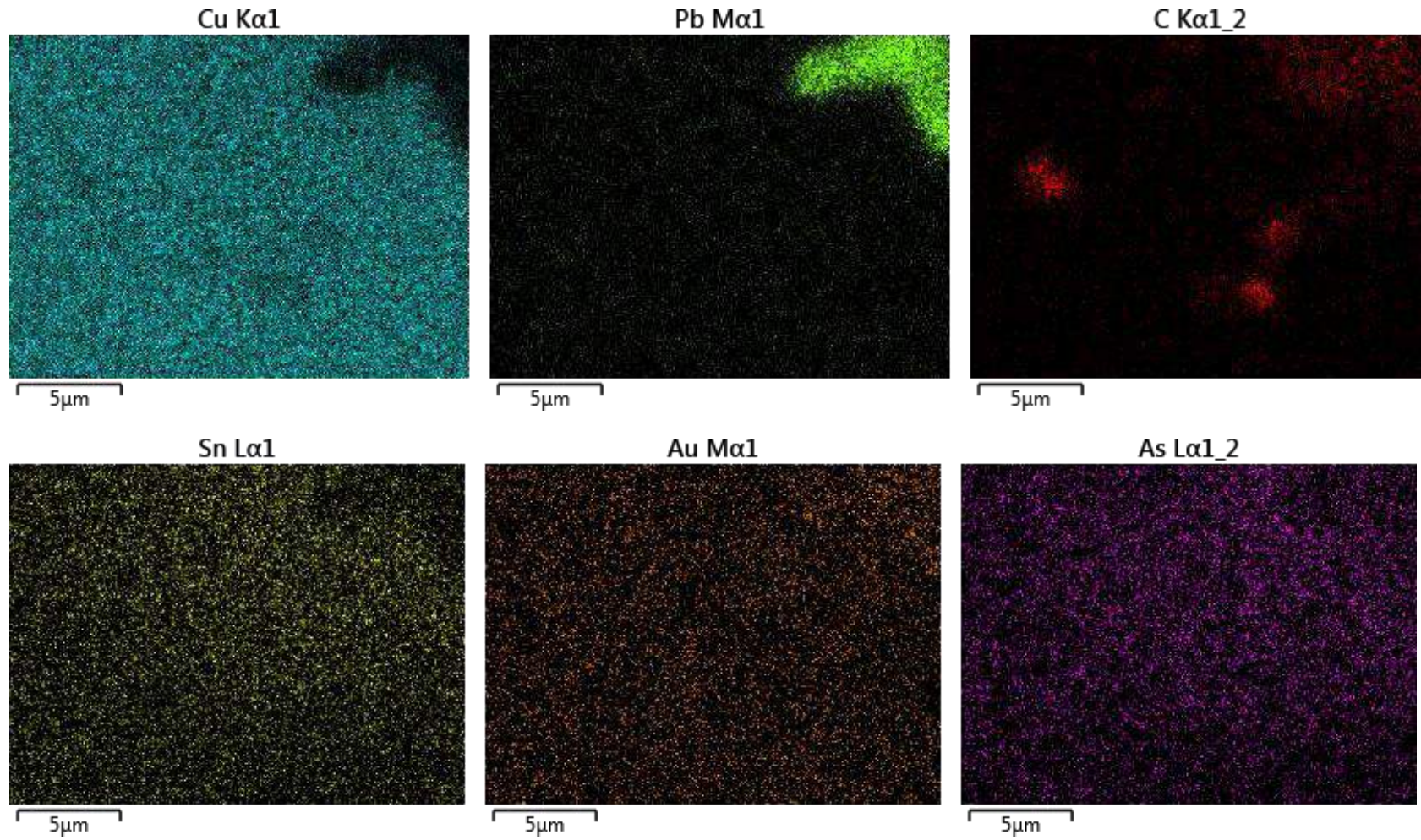
Elektronenbild 6

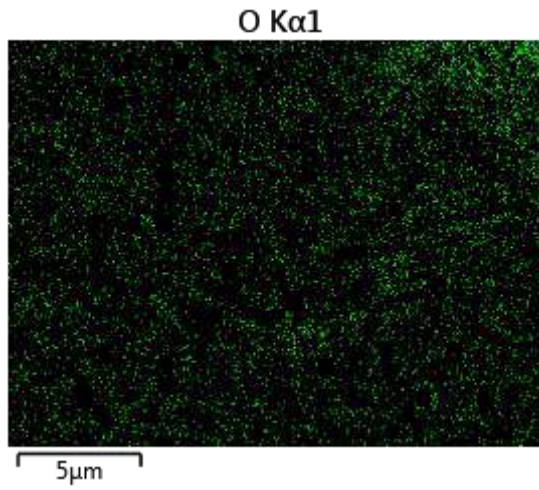


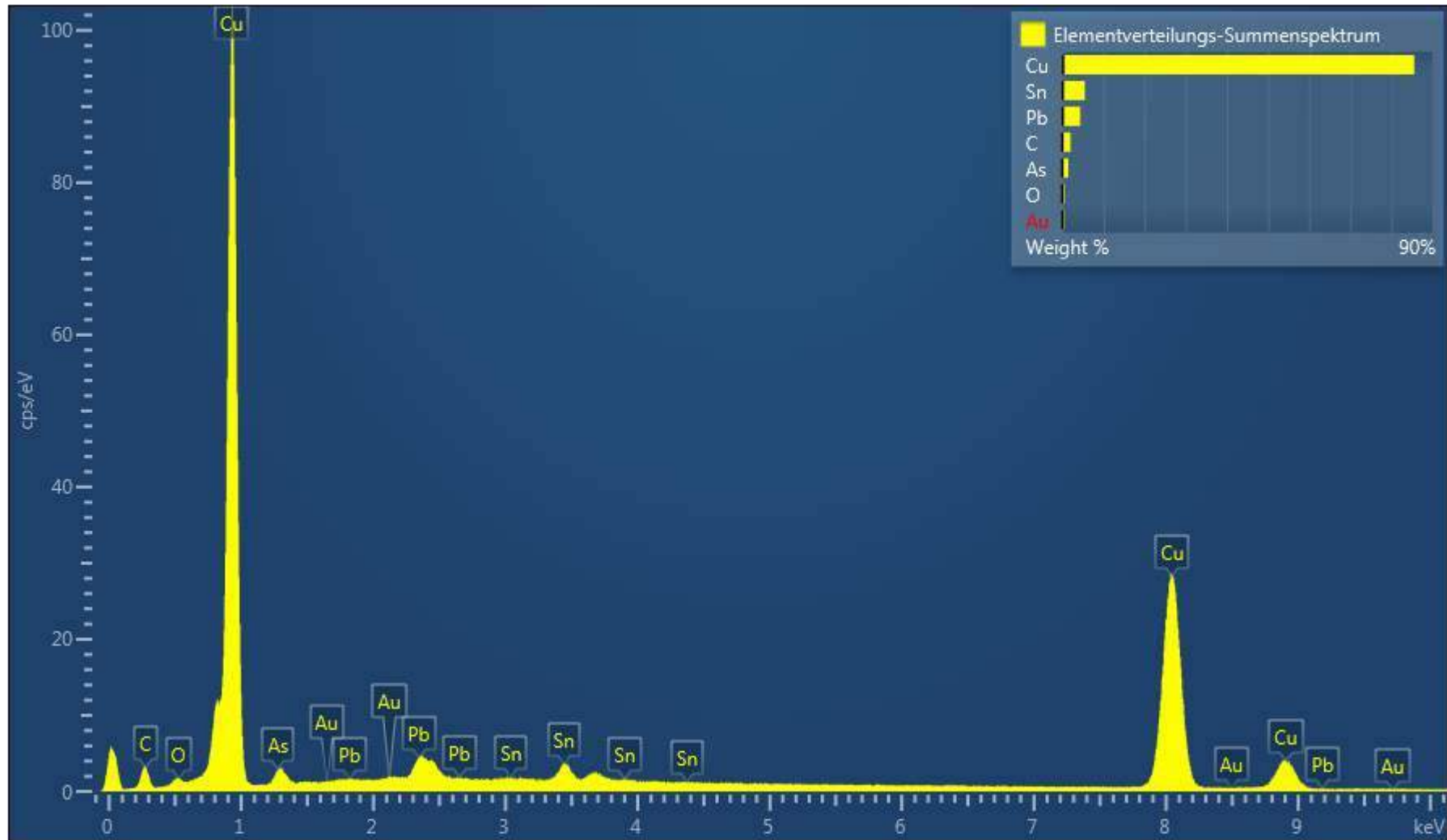
5µm

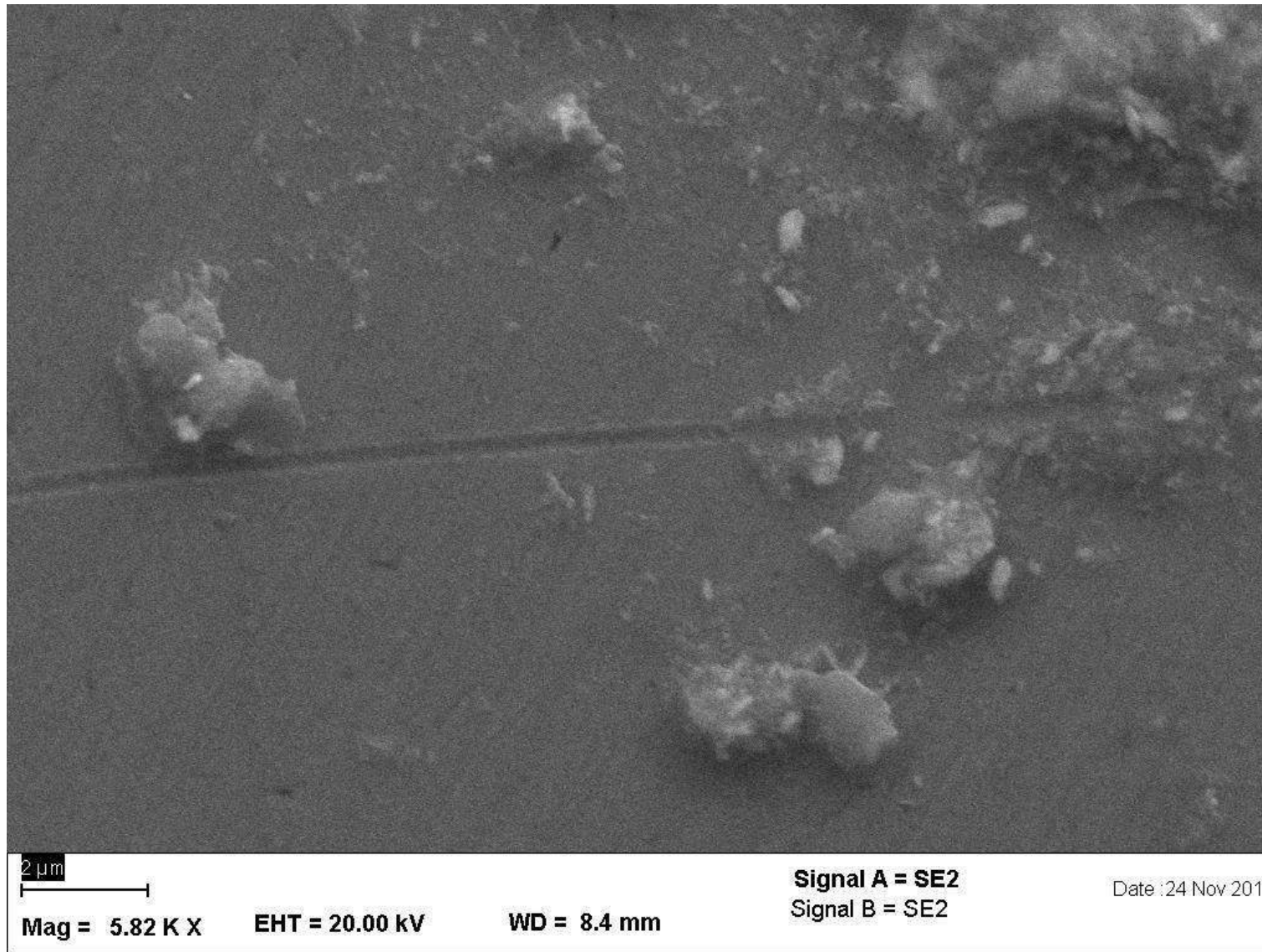
EDS-Überlagerungsbild 6



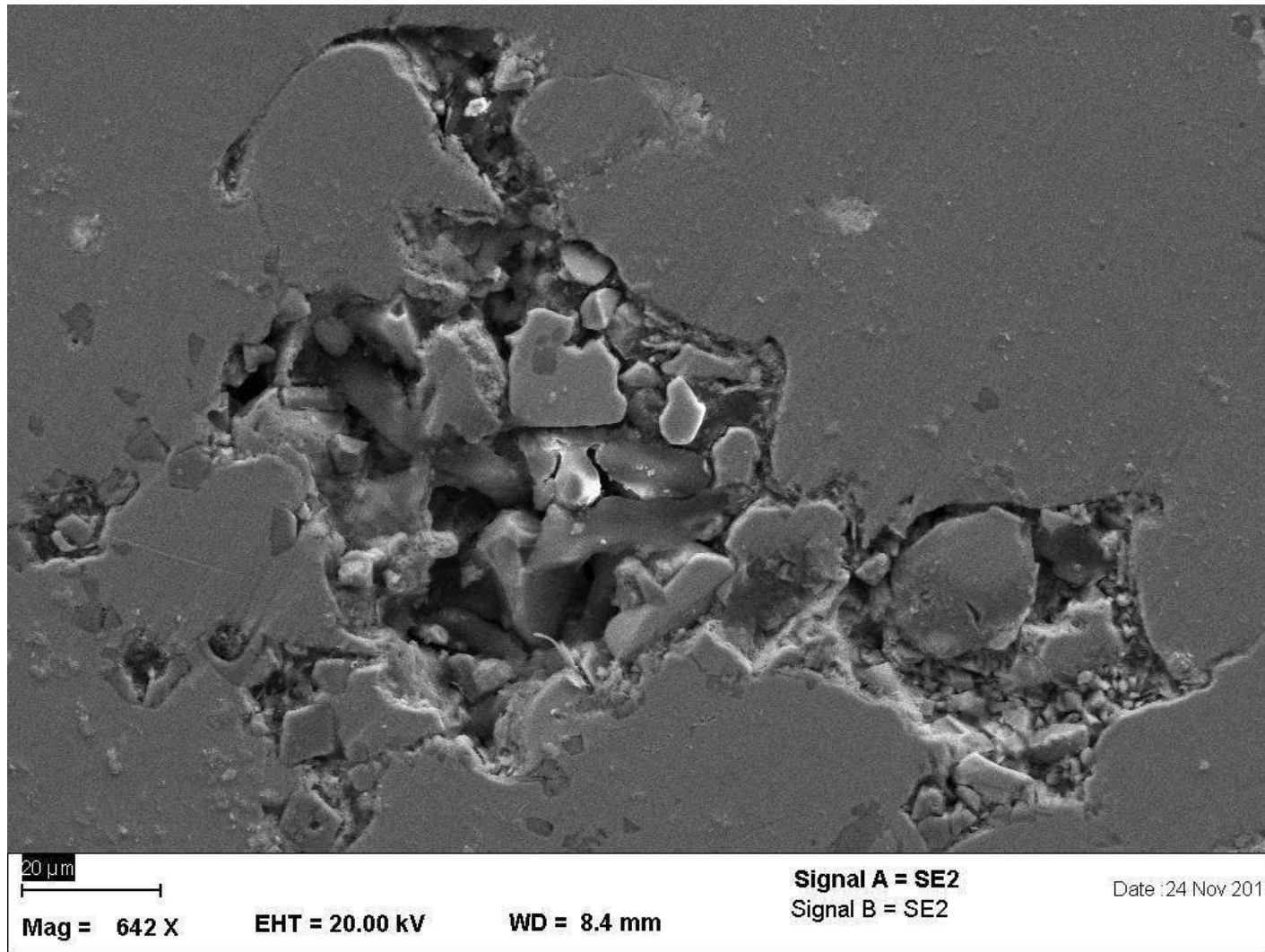






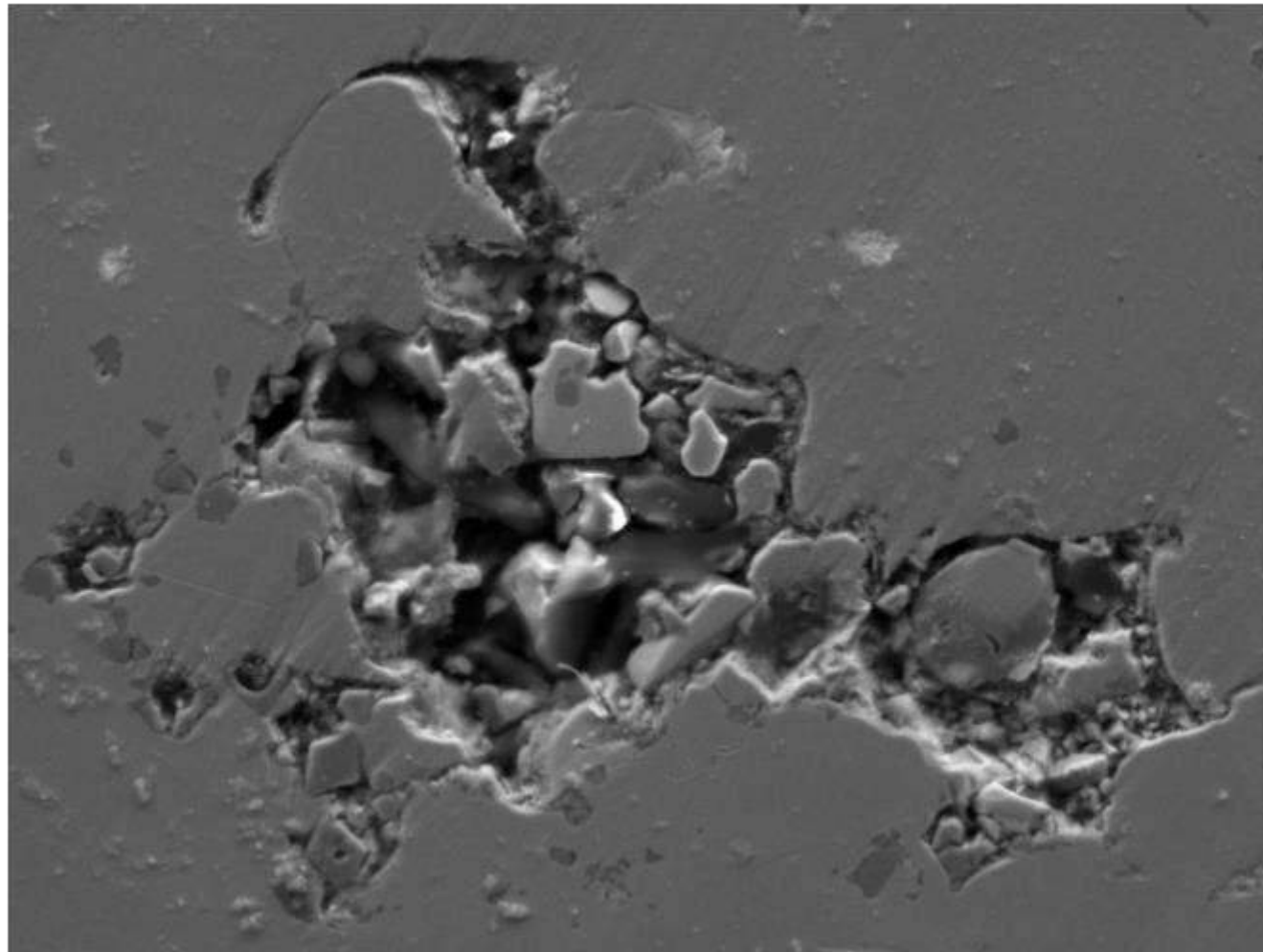


SEM Image of Alloy 1a1 (unpatinated)



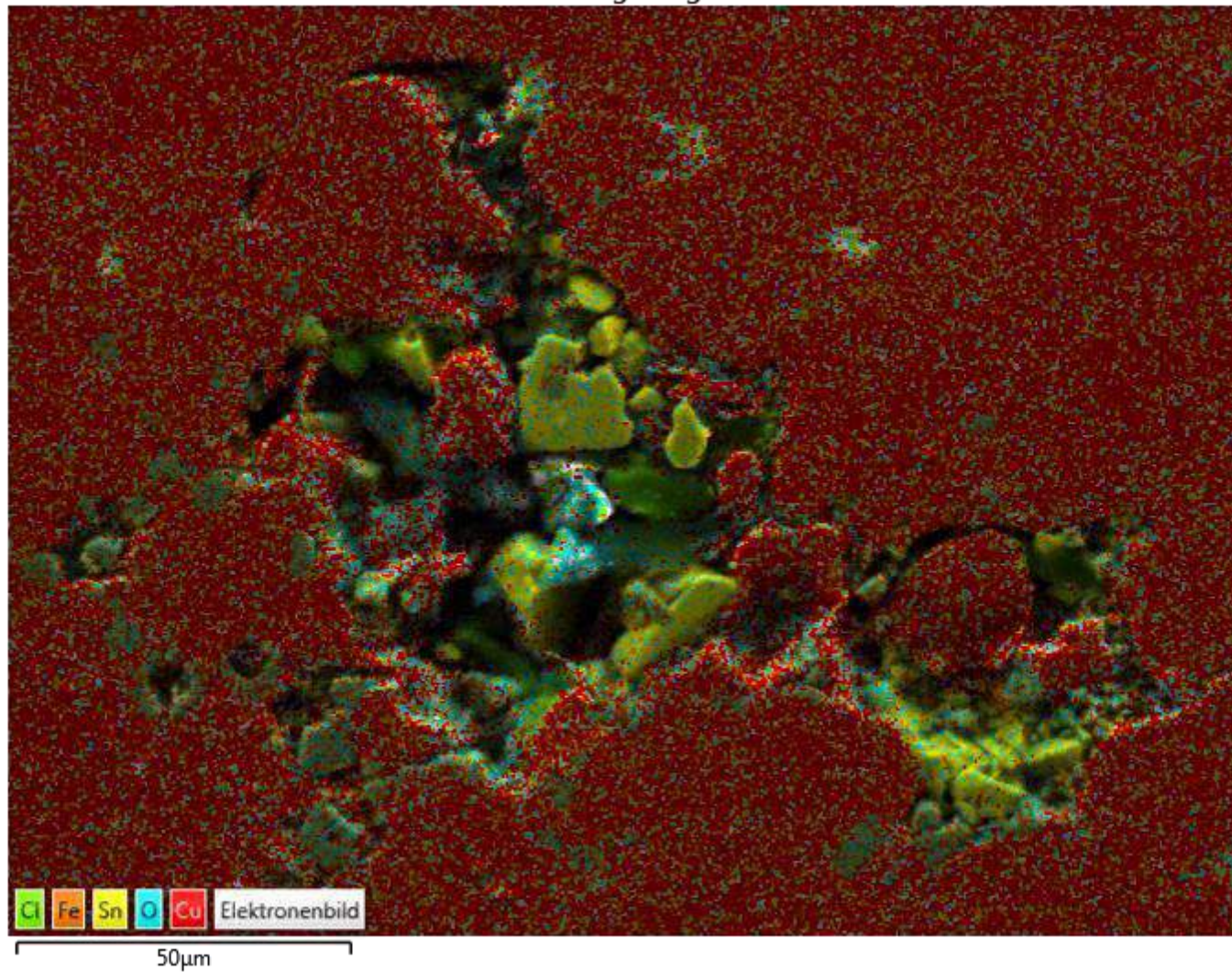
SEM Image of Alloy 1a1 (unpatinated)

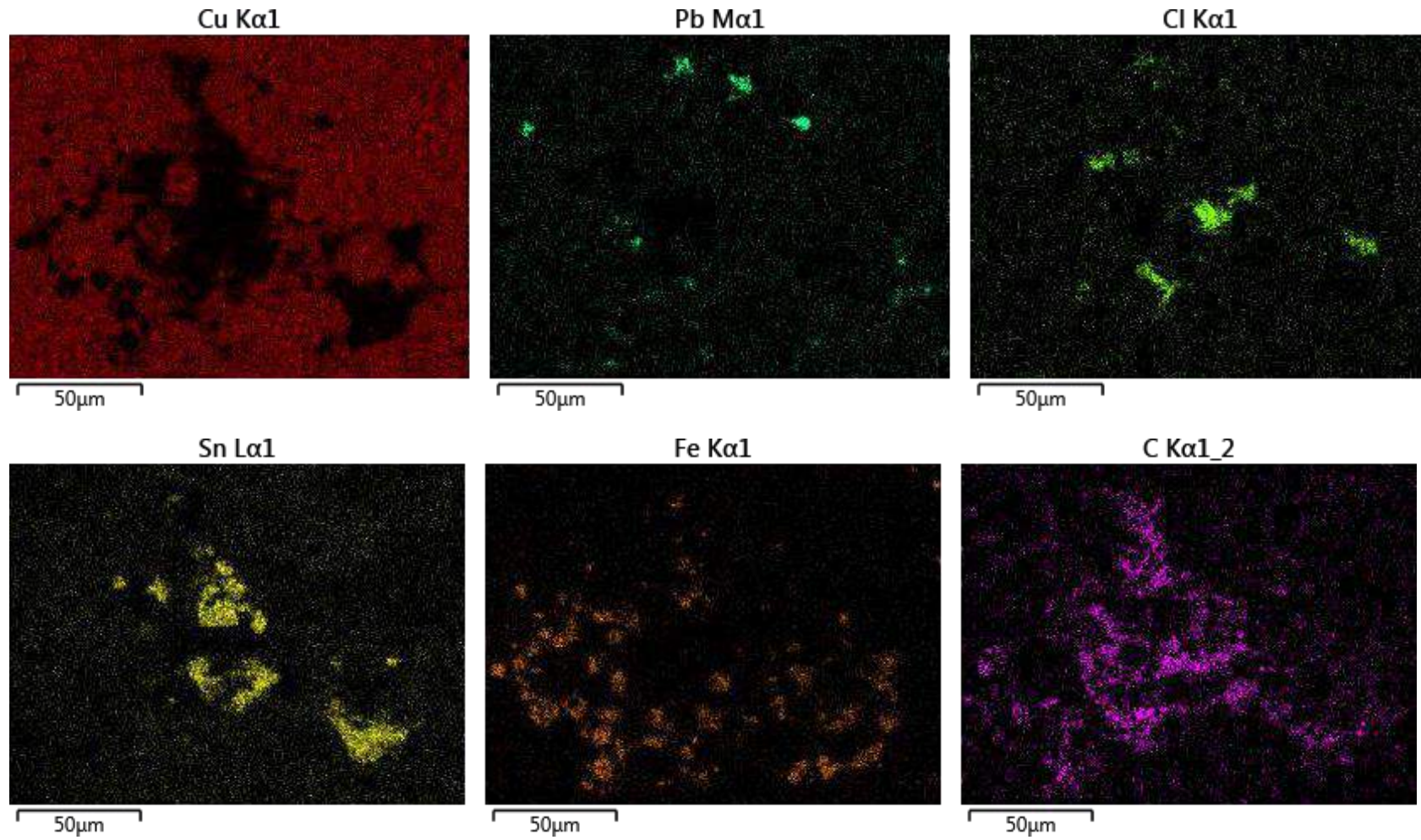
Elektronenbild 7

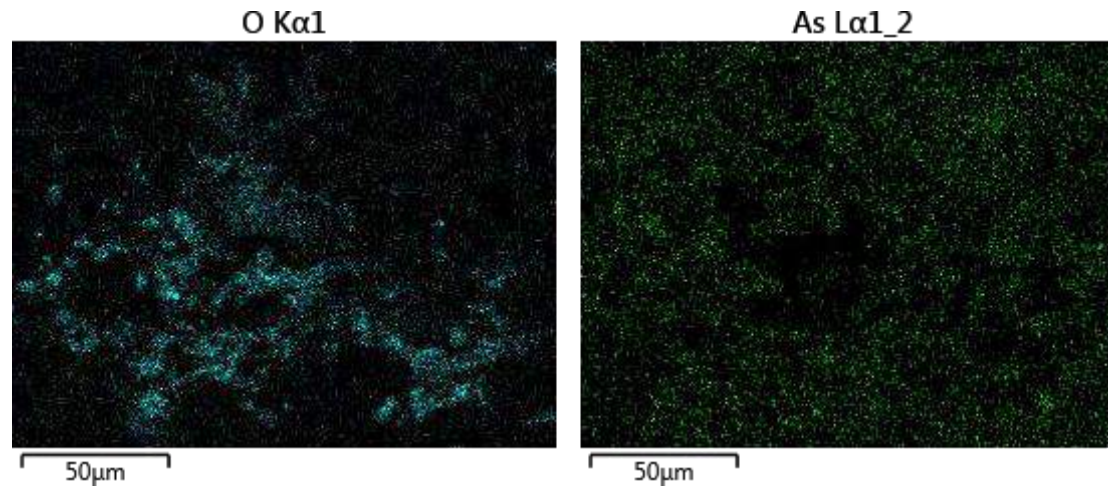


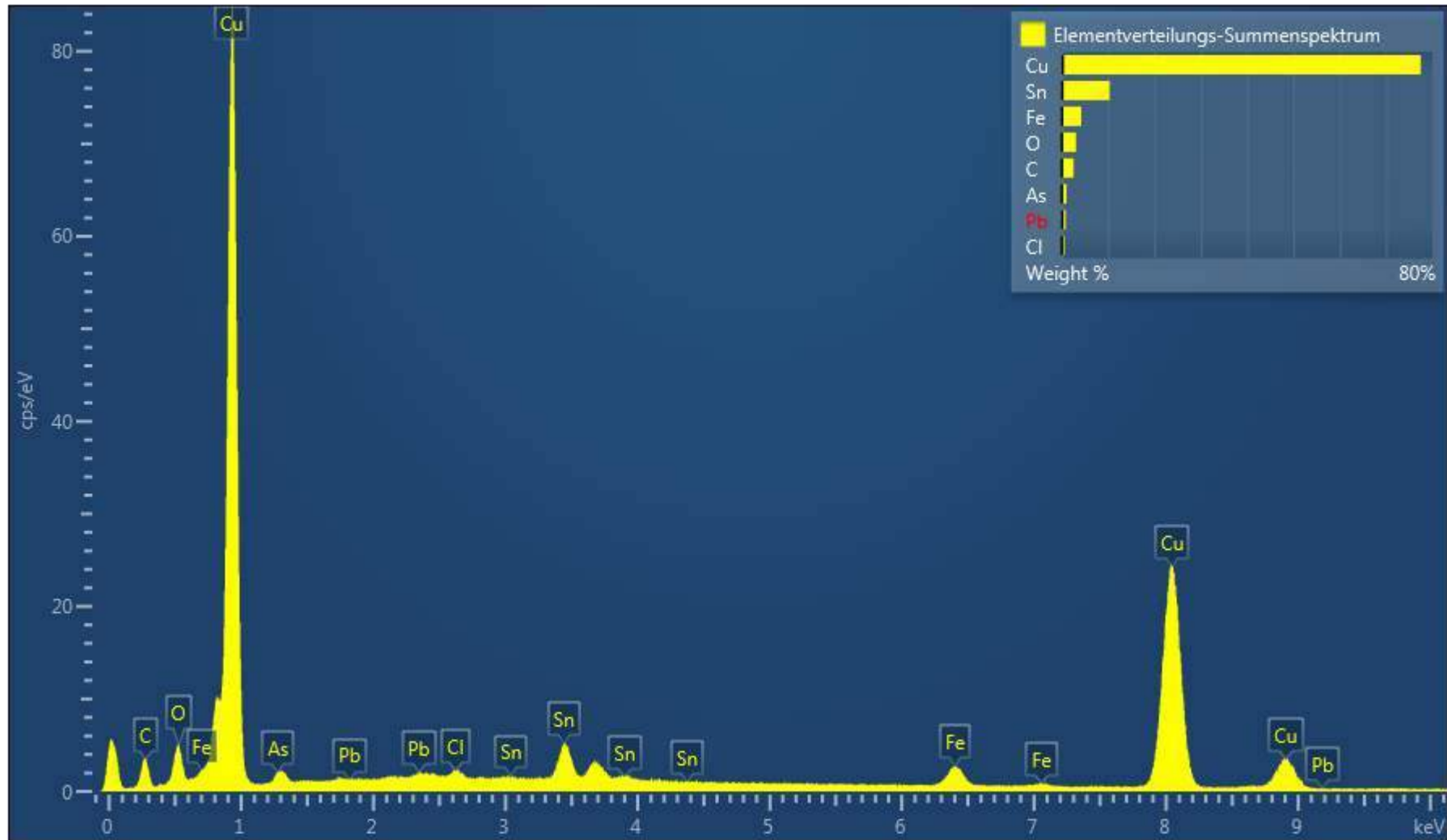
50µm

EDS-Überlagerungsbild 7

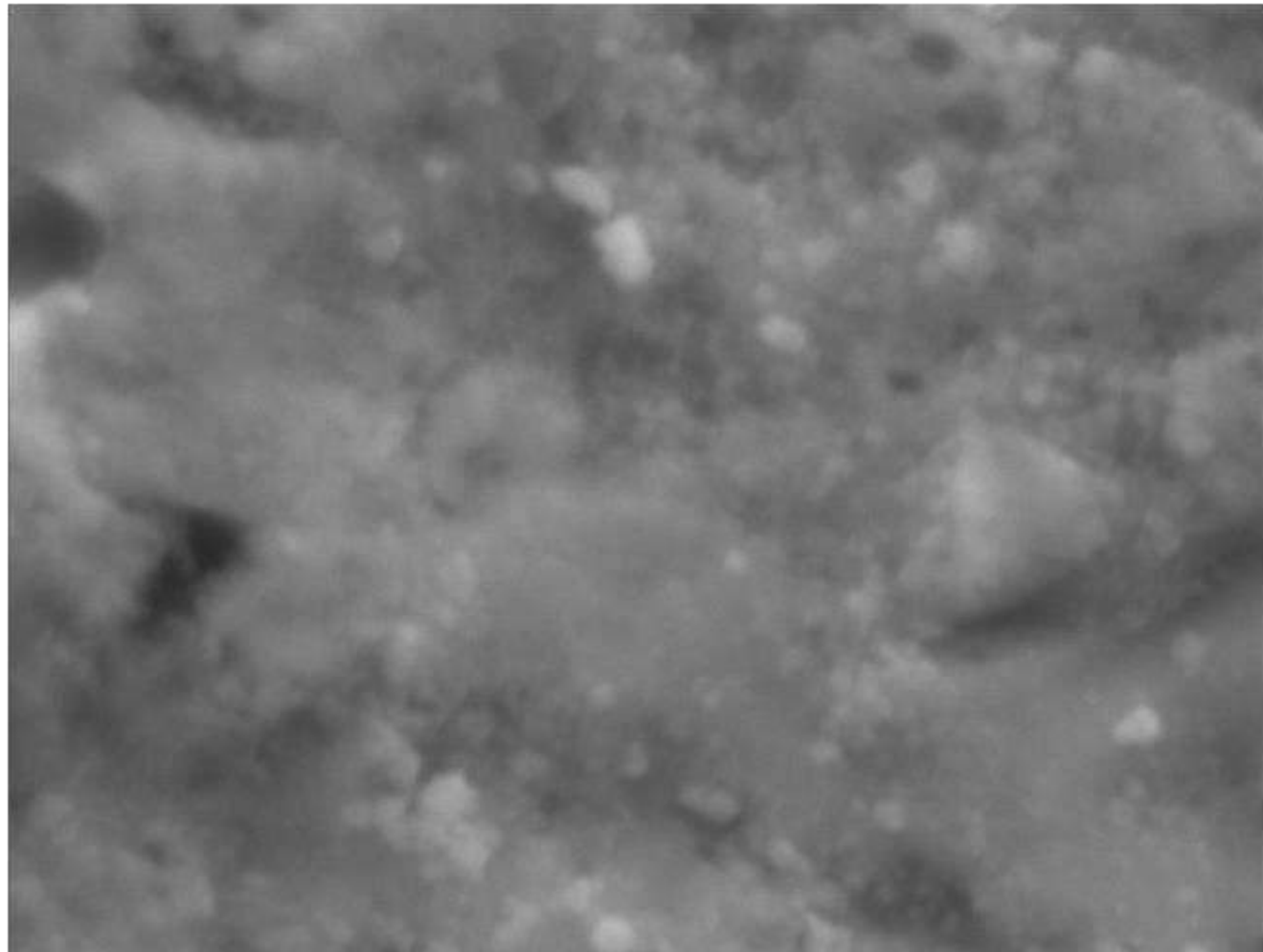






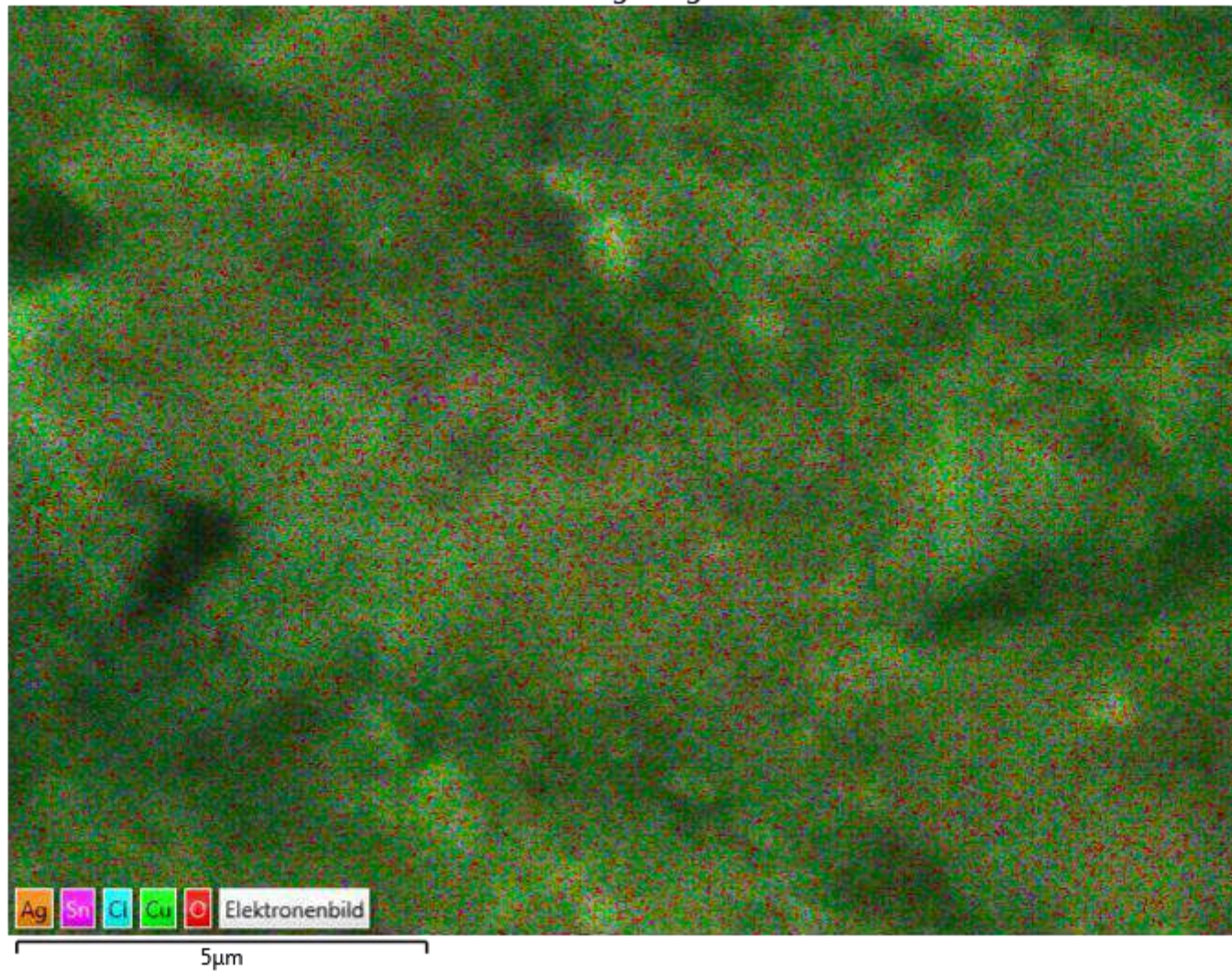


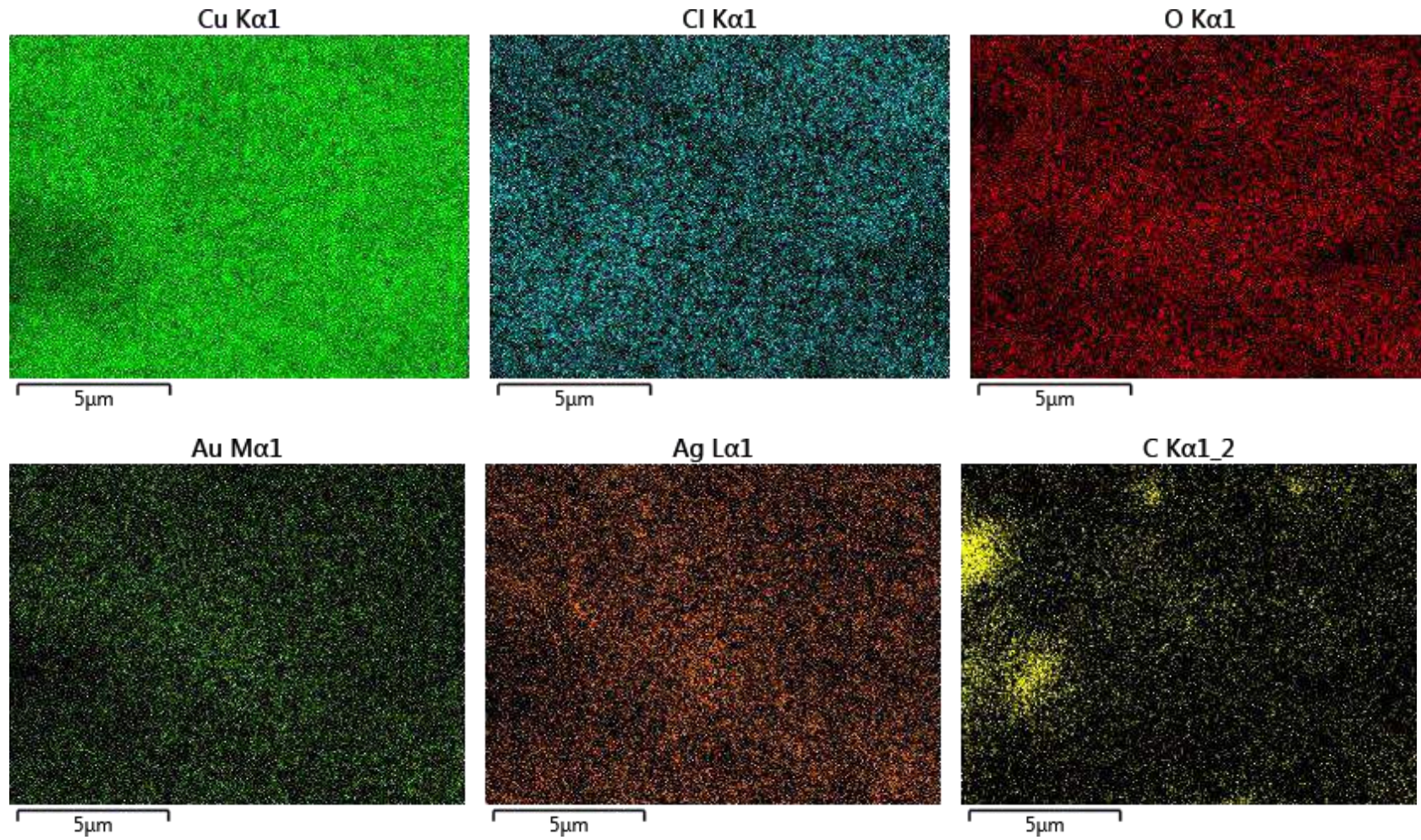
Elektronenbild 8



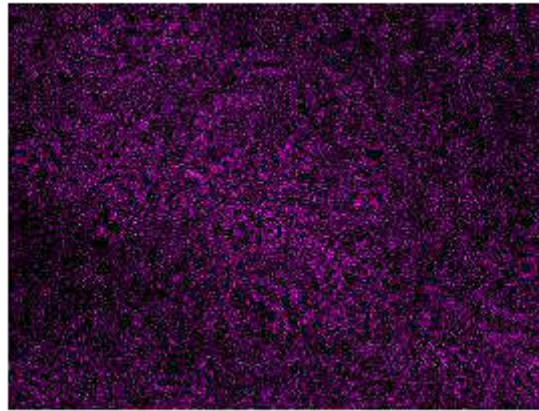
5µm

EDS-Überlagerungsbild 8

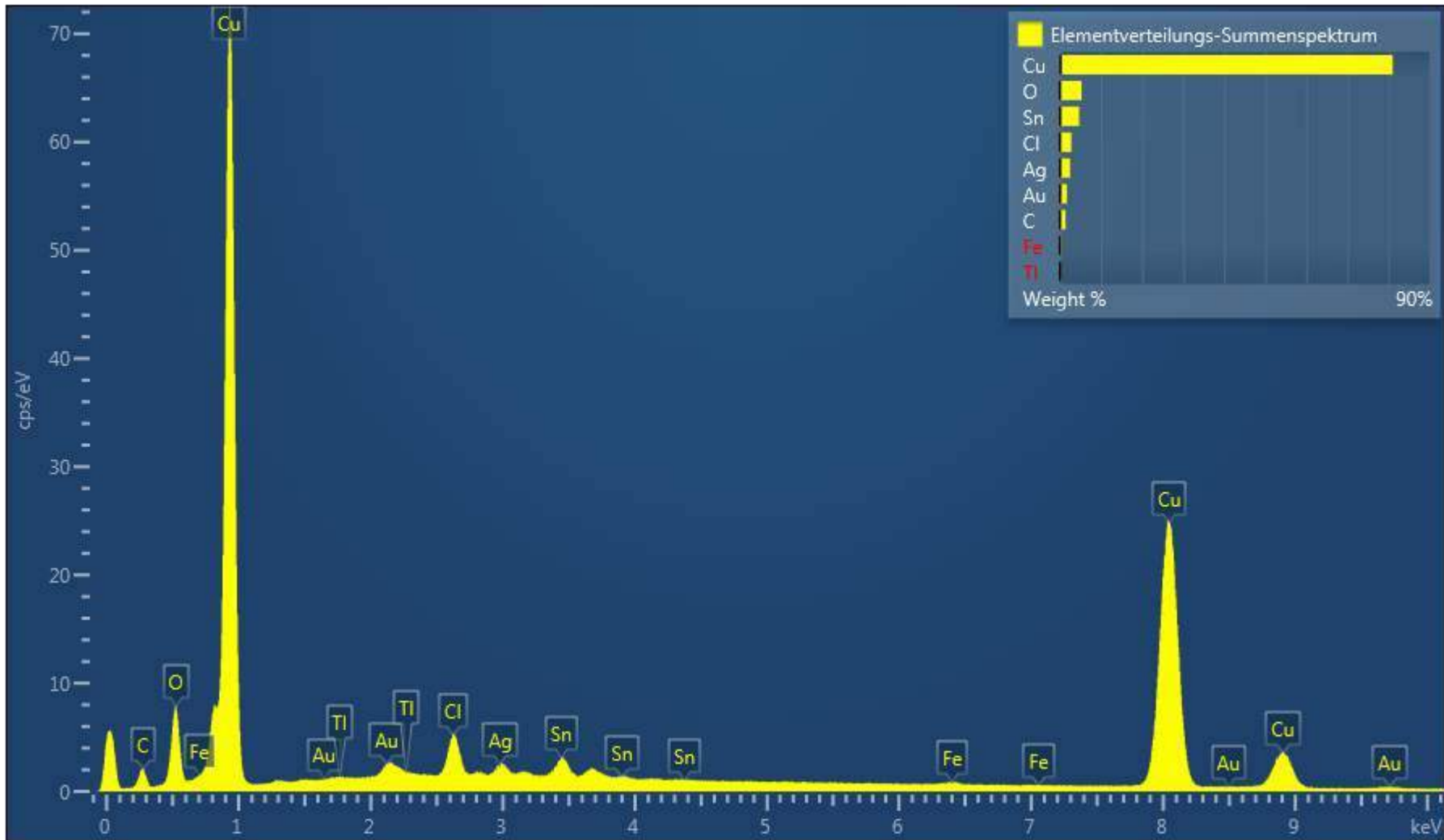


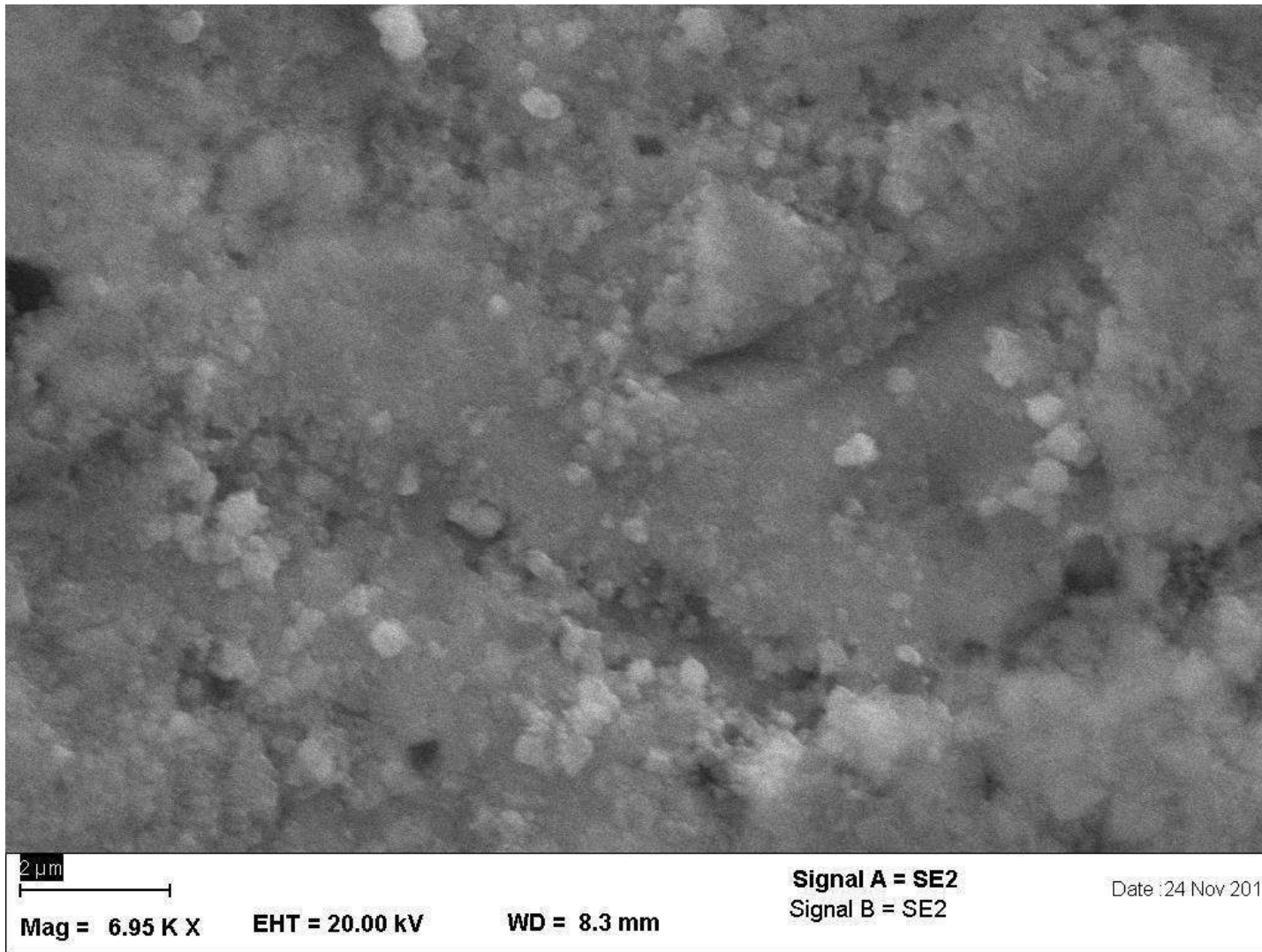


Sn L α 1

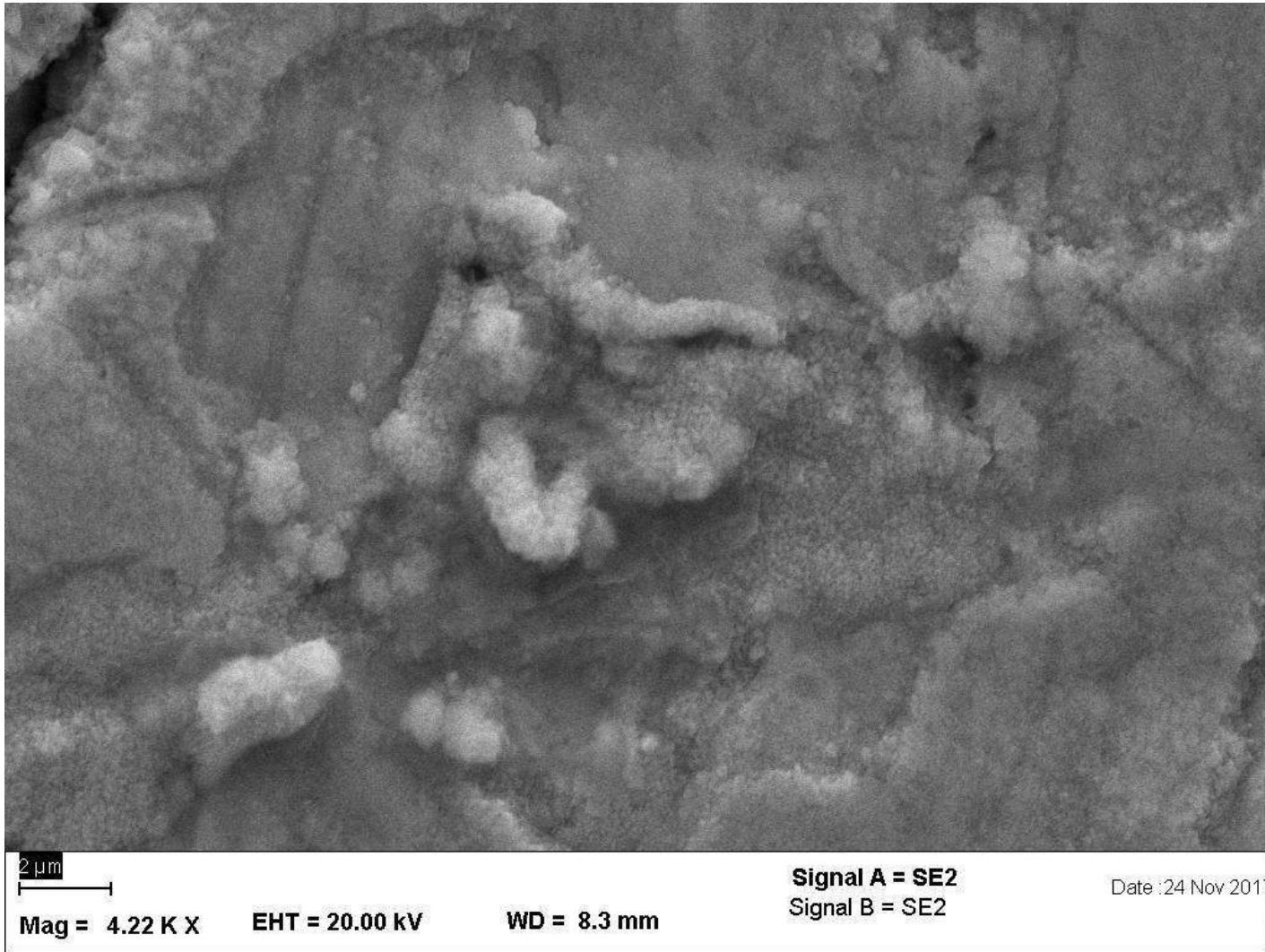


5 μ m



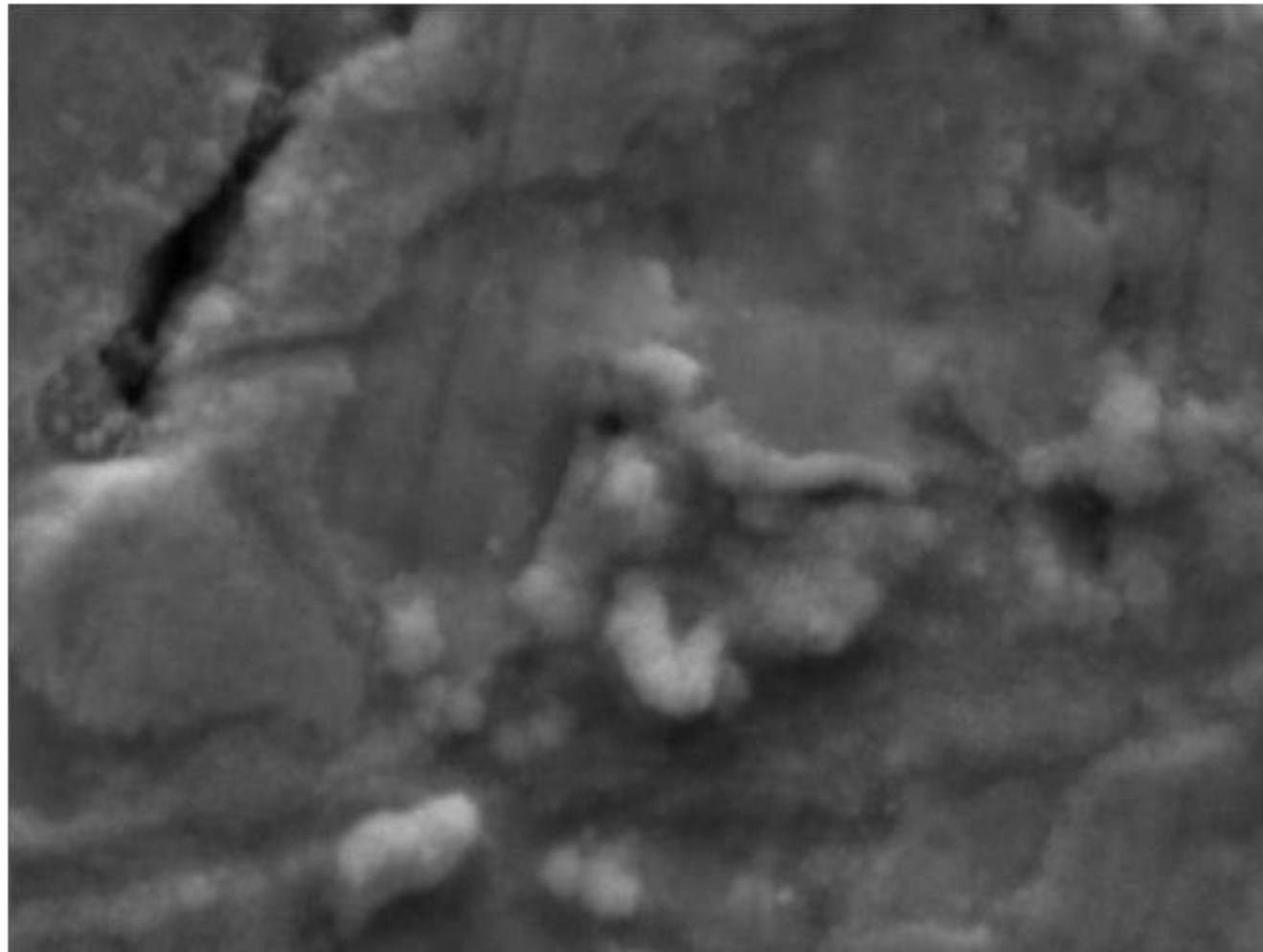


SEM image of Alloy 3a1 – Niiro (Exp. 22)



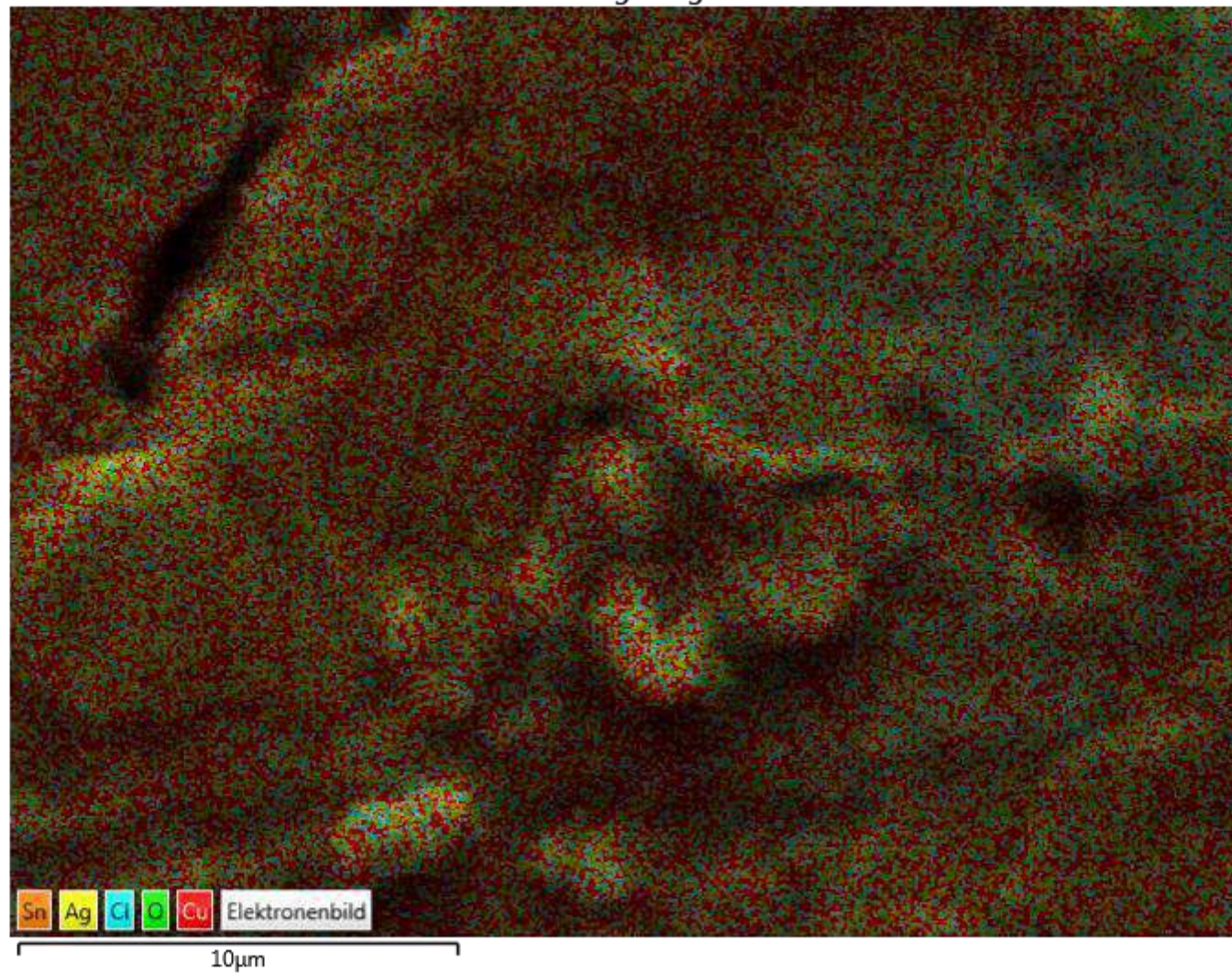
SEM image of Alloy 3a1 – Niiro (Exp. 22)

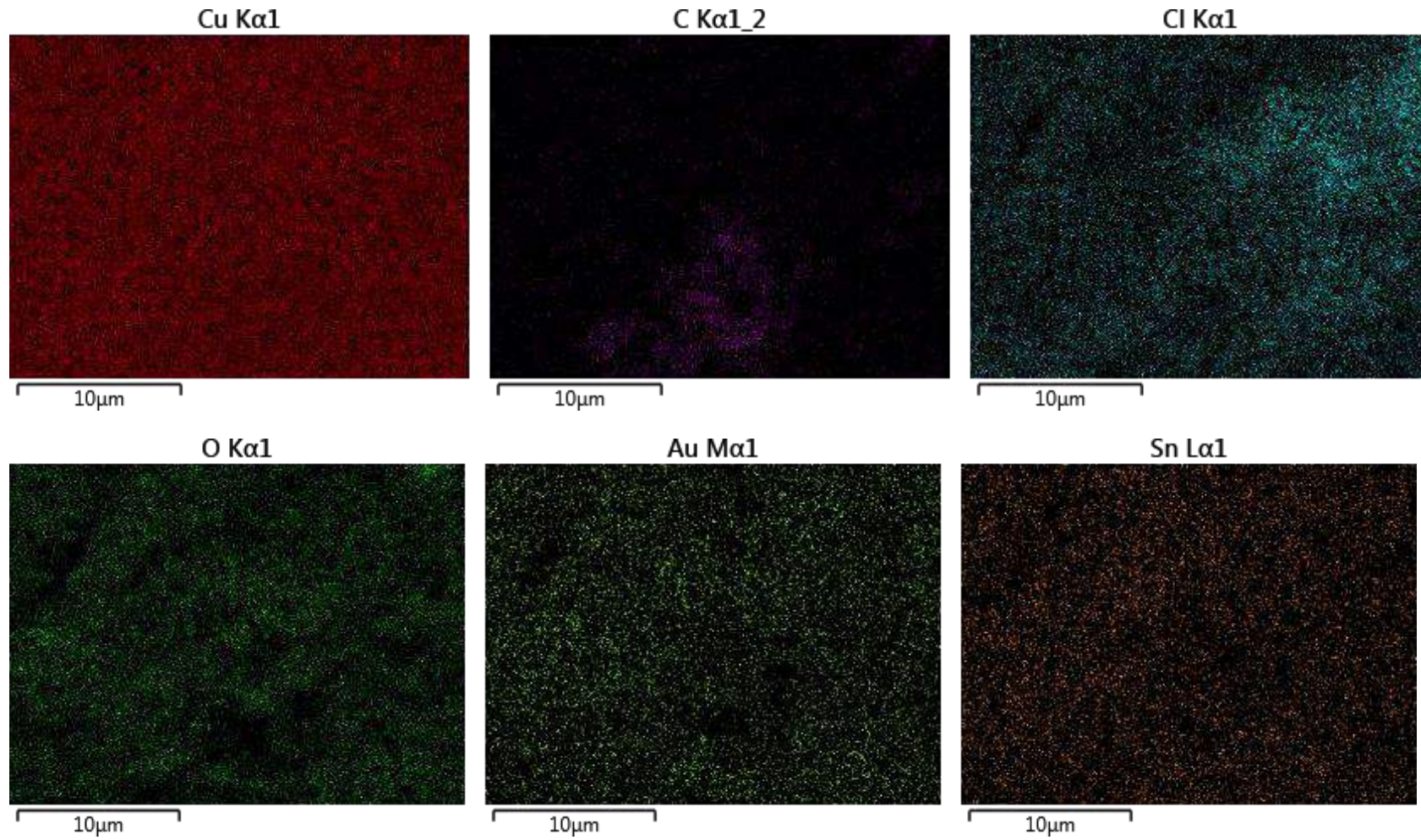
Elektronenbild 9



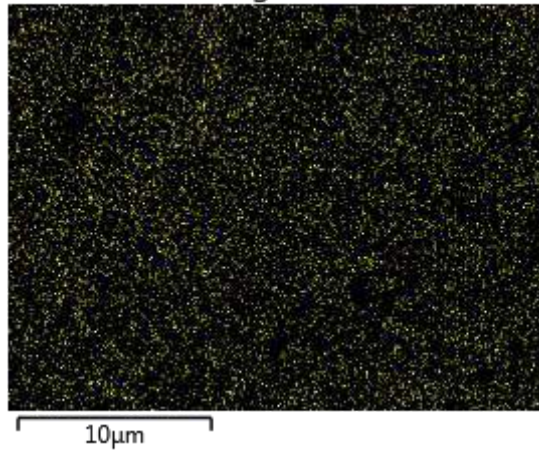
10µm

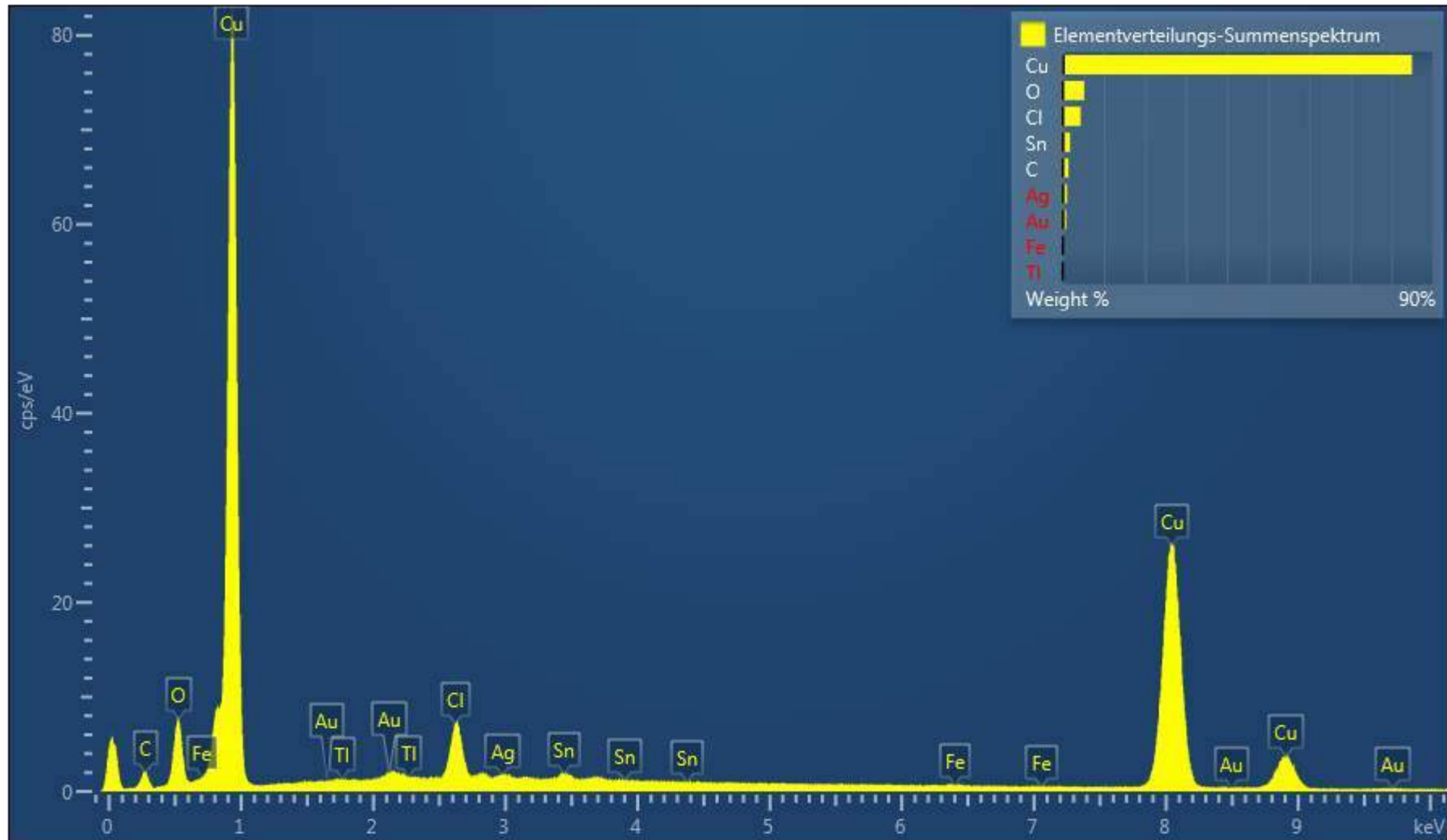
EDS-Überlagerungsbild 9



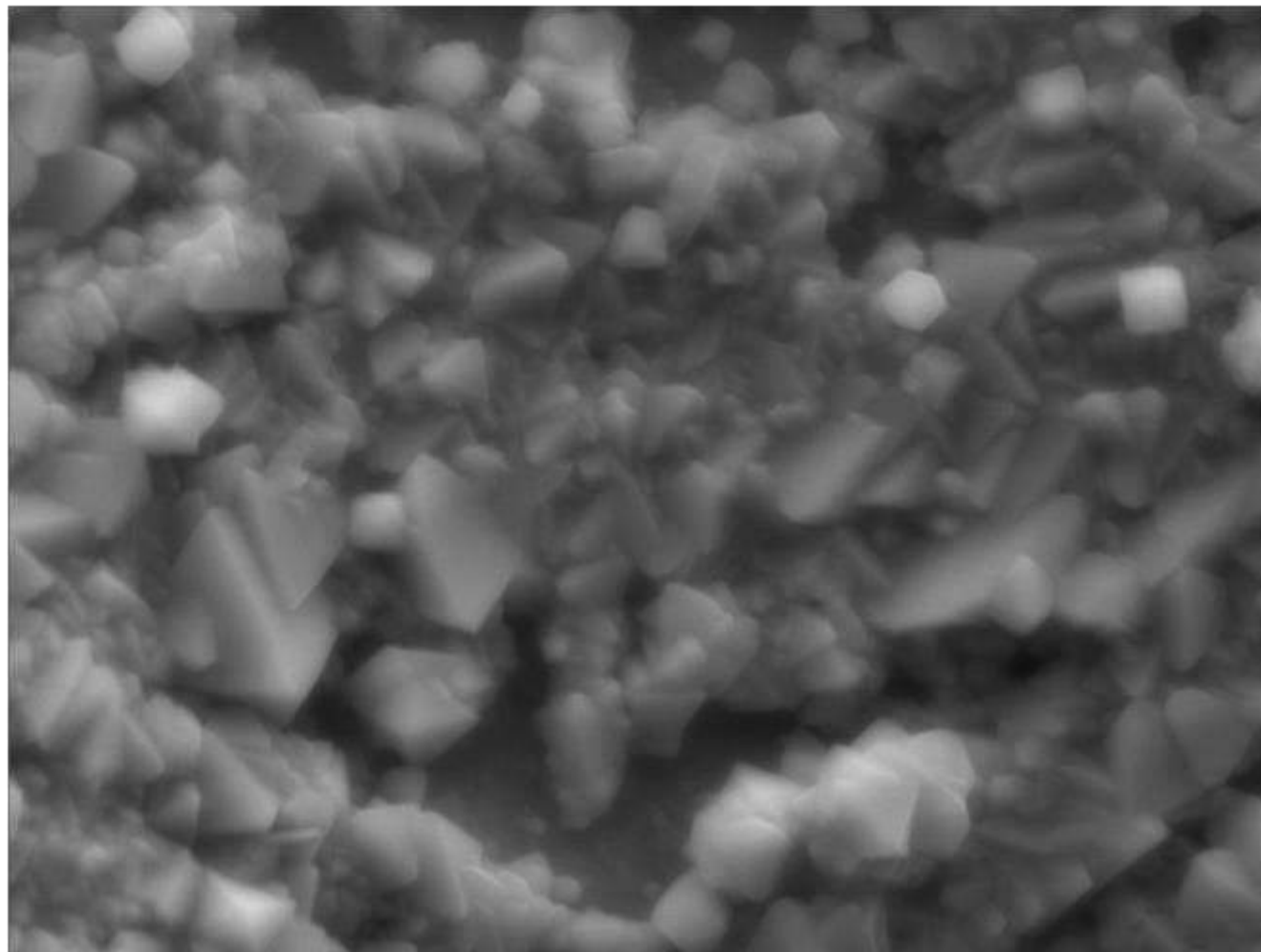


Ag L α 1



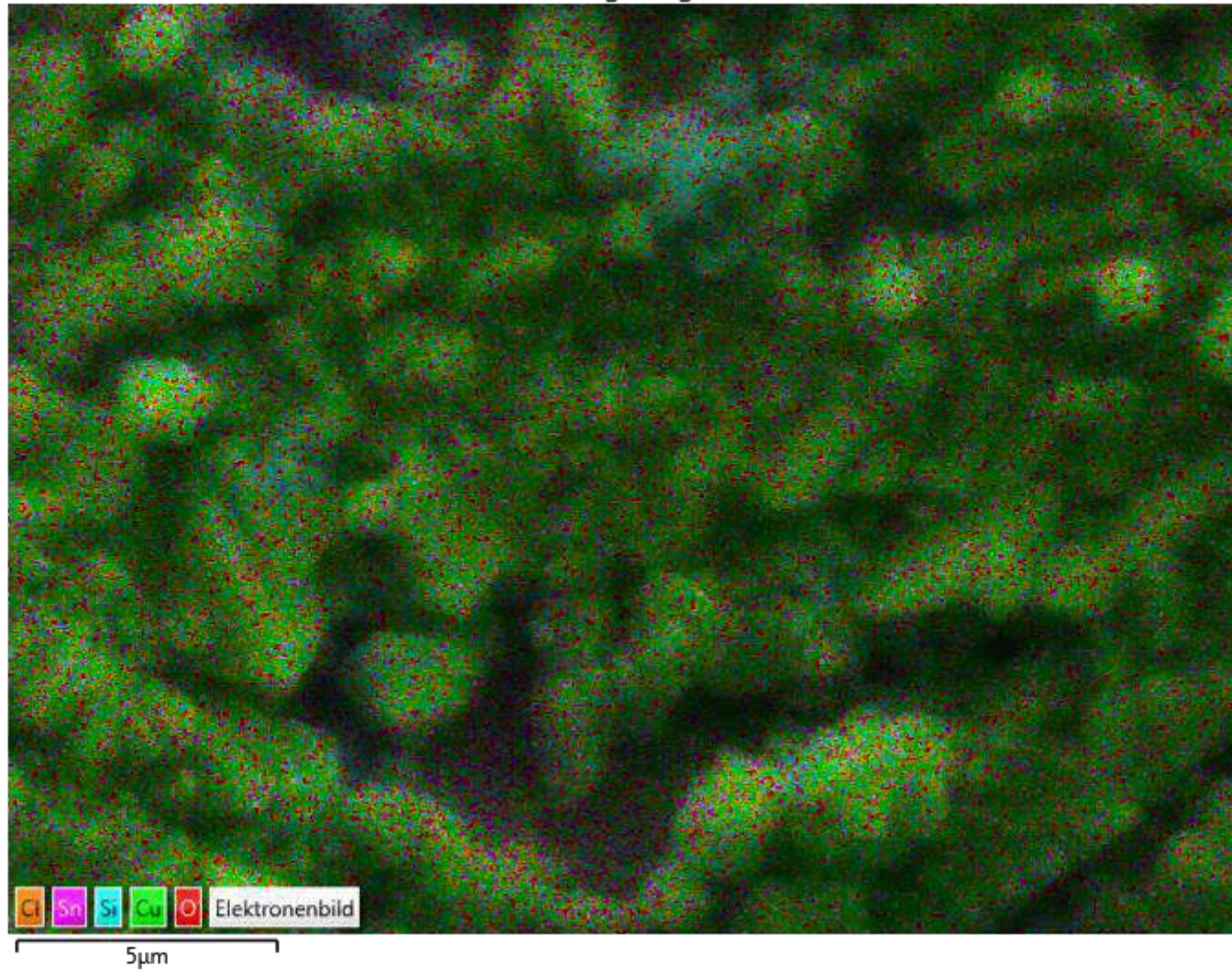


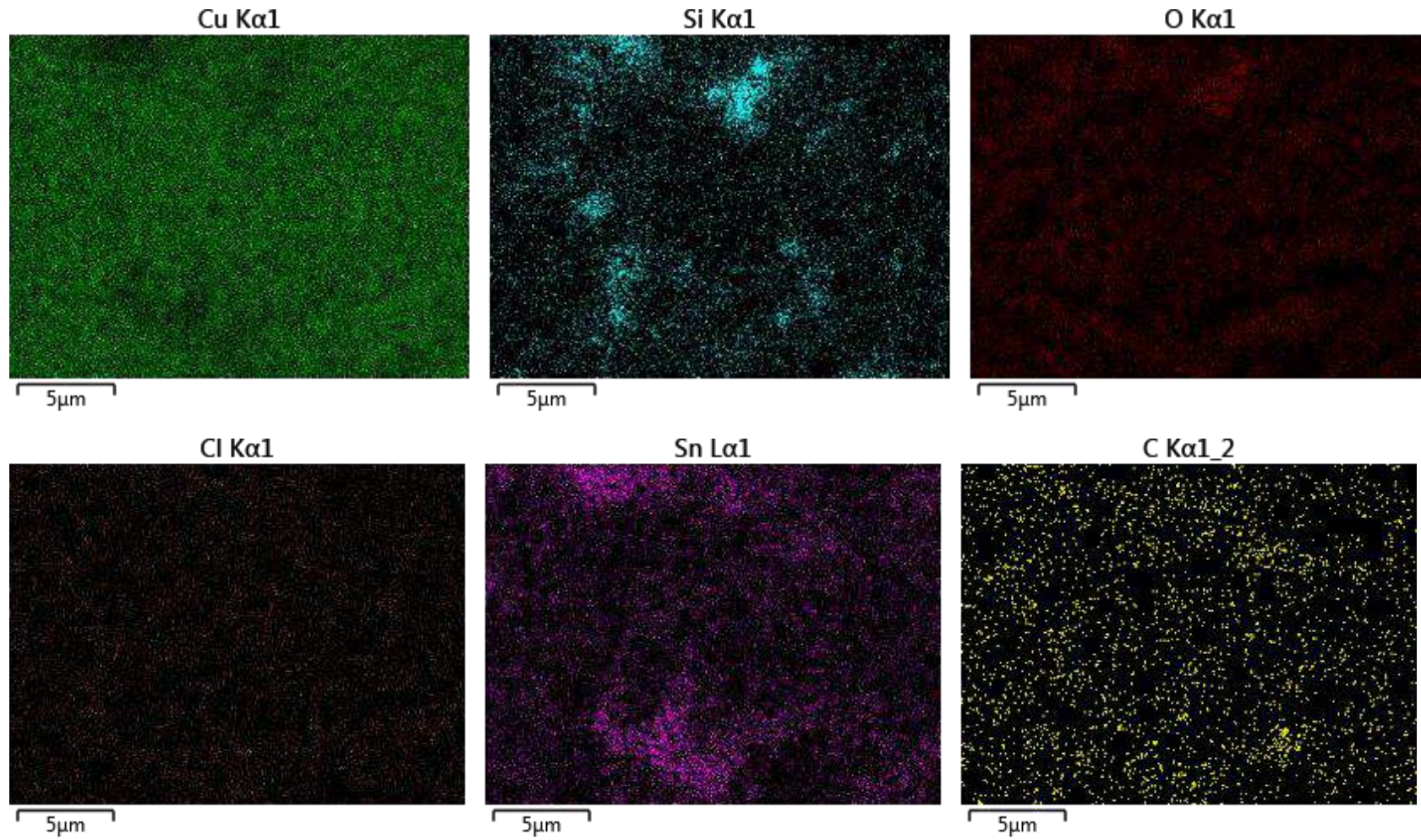
Elektronenbild 10

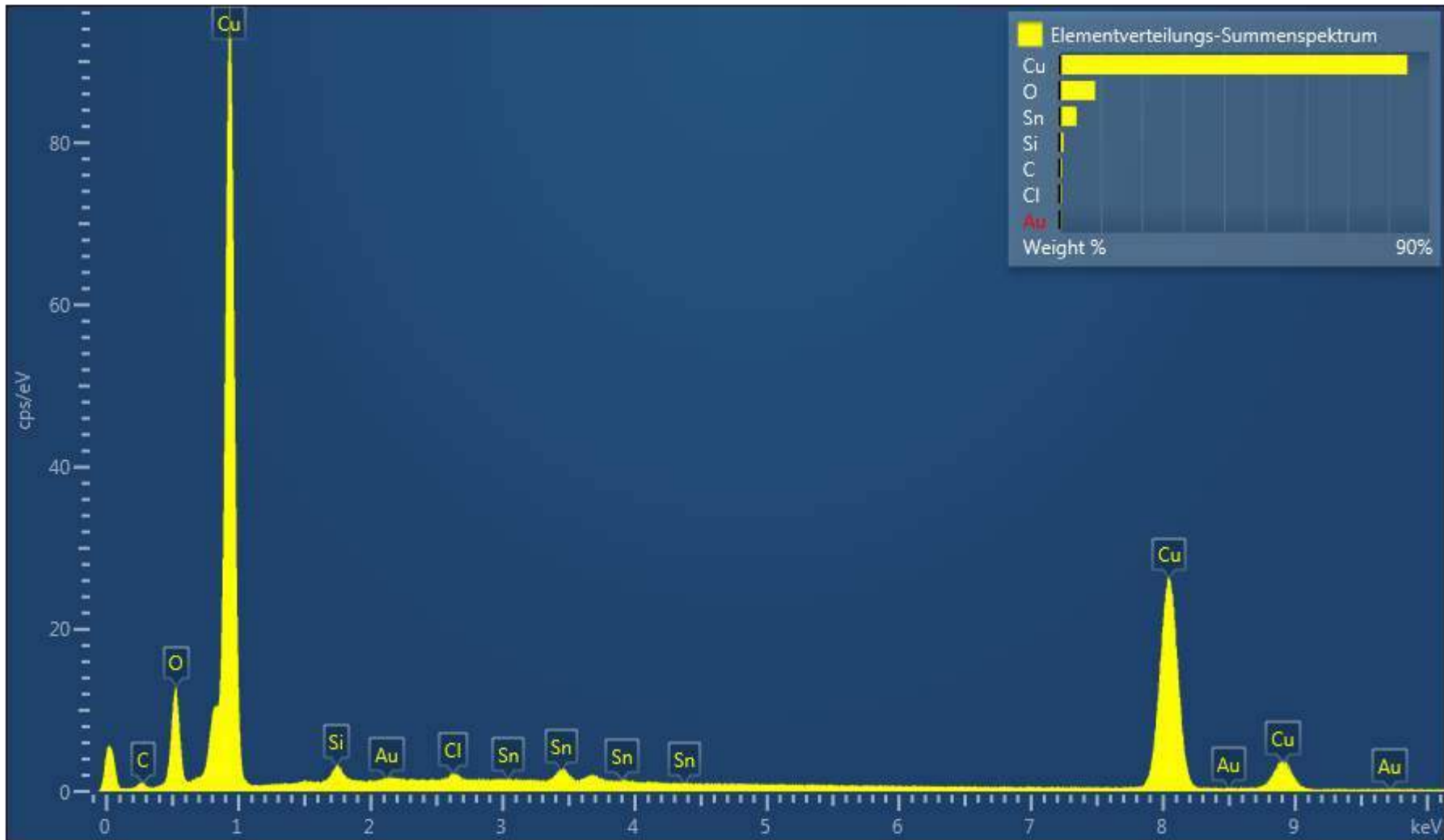


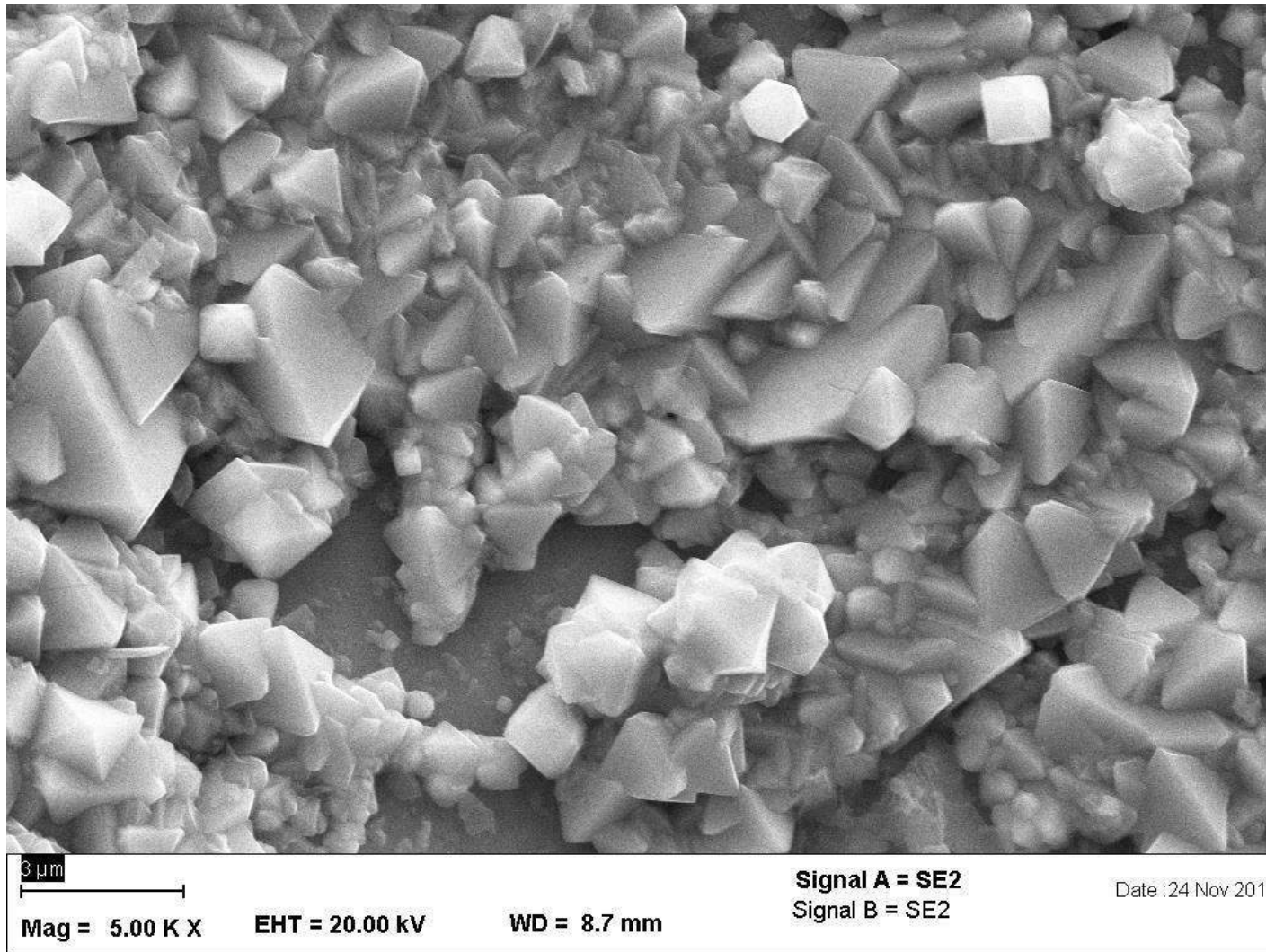
5µm

EDS-Überlagerungsbild 10



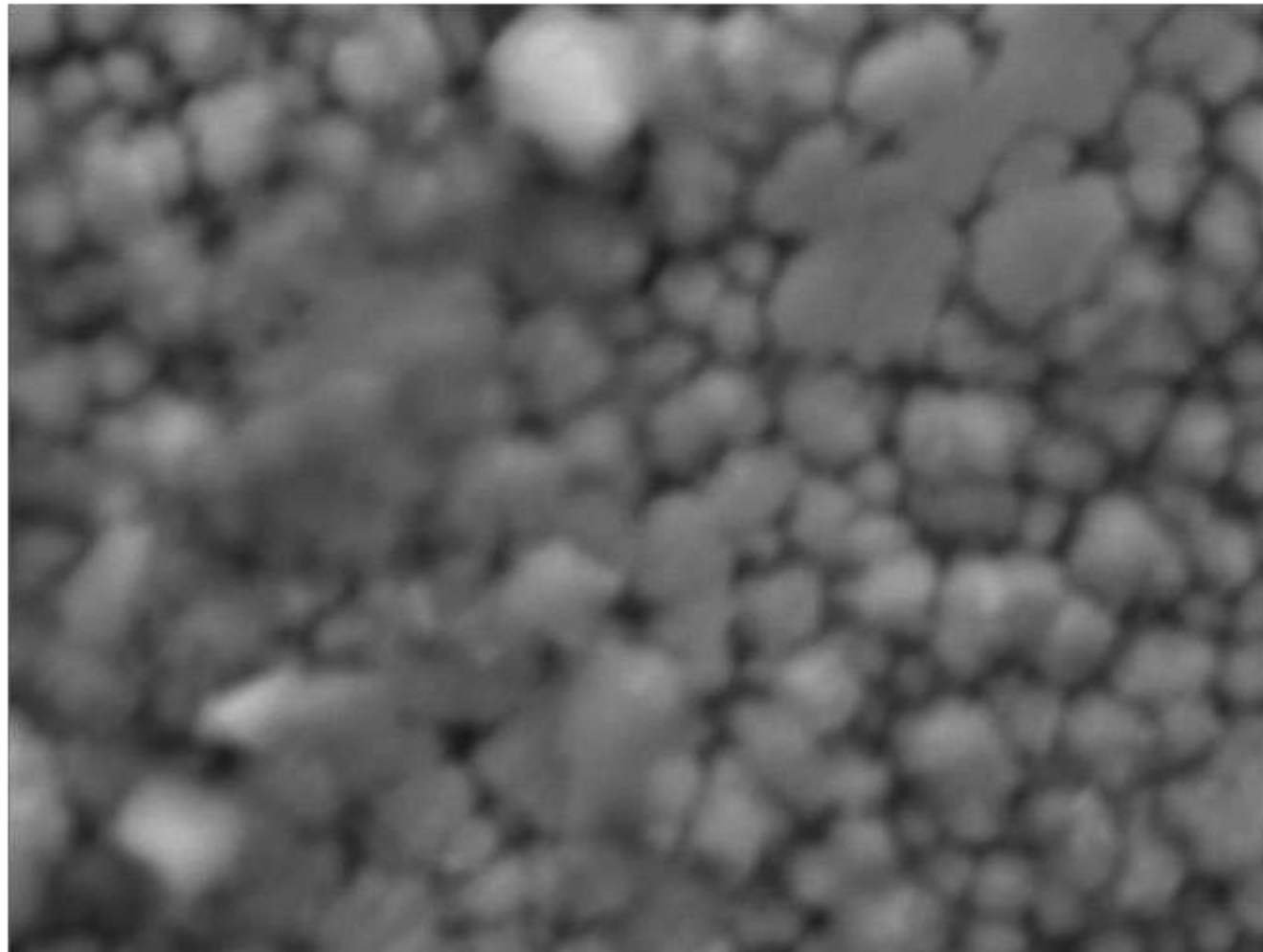




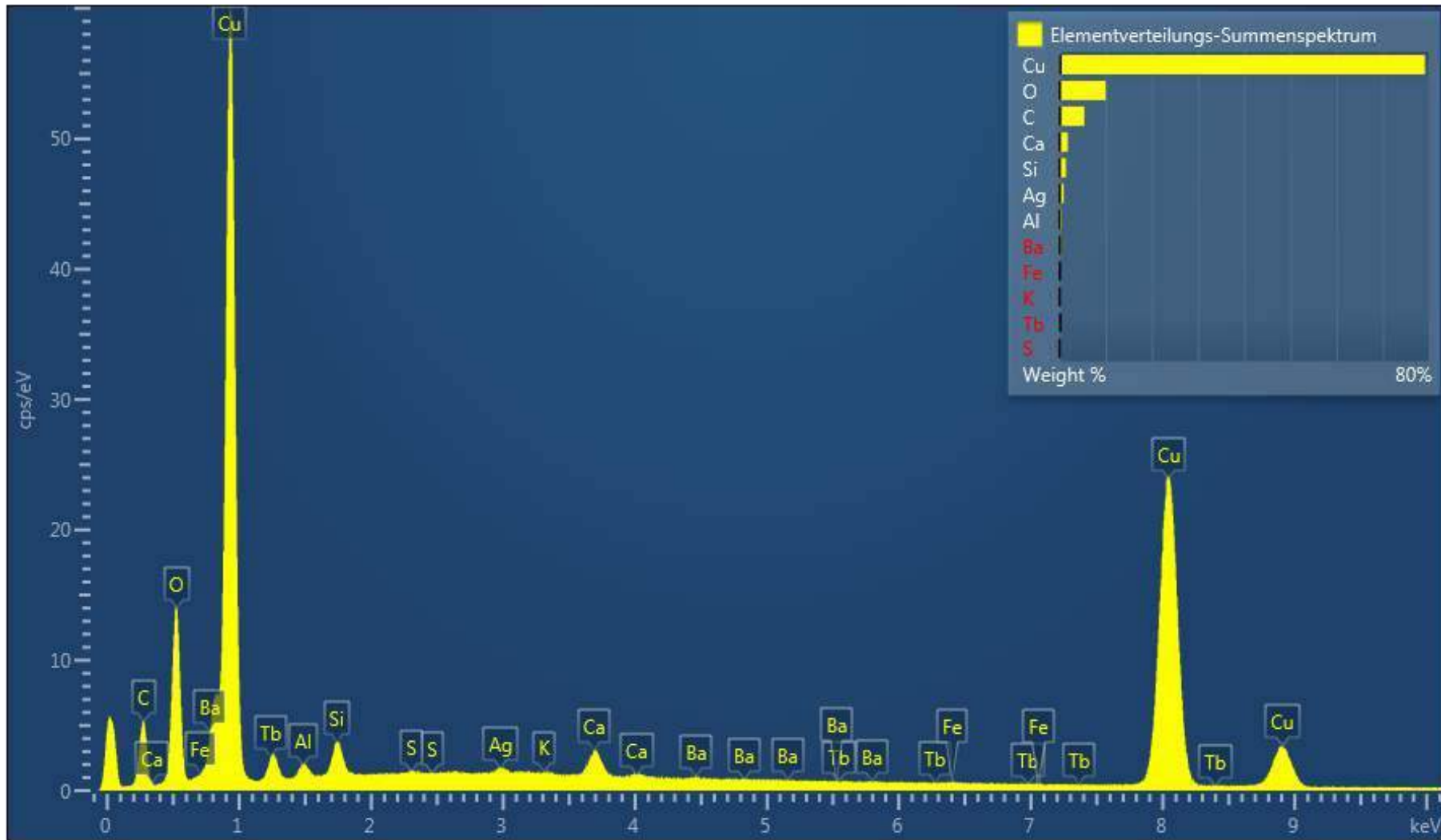


SEM Image of Alloy 7a2 – Tapwater + Natronmix (Exp. 19d)

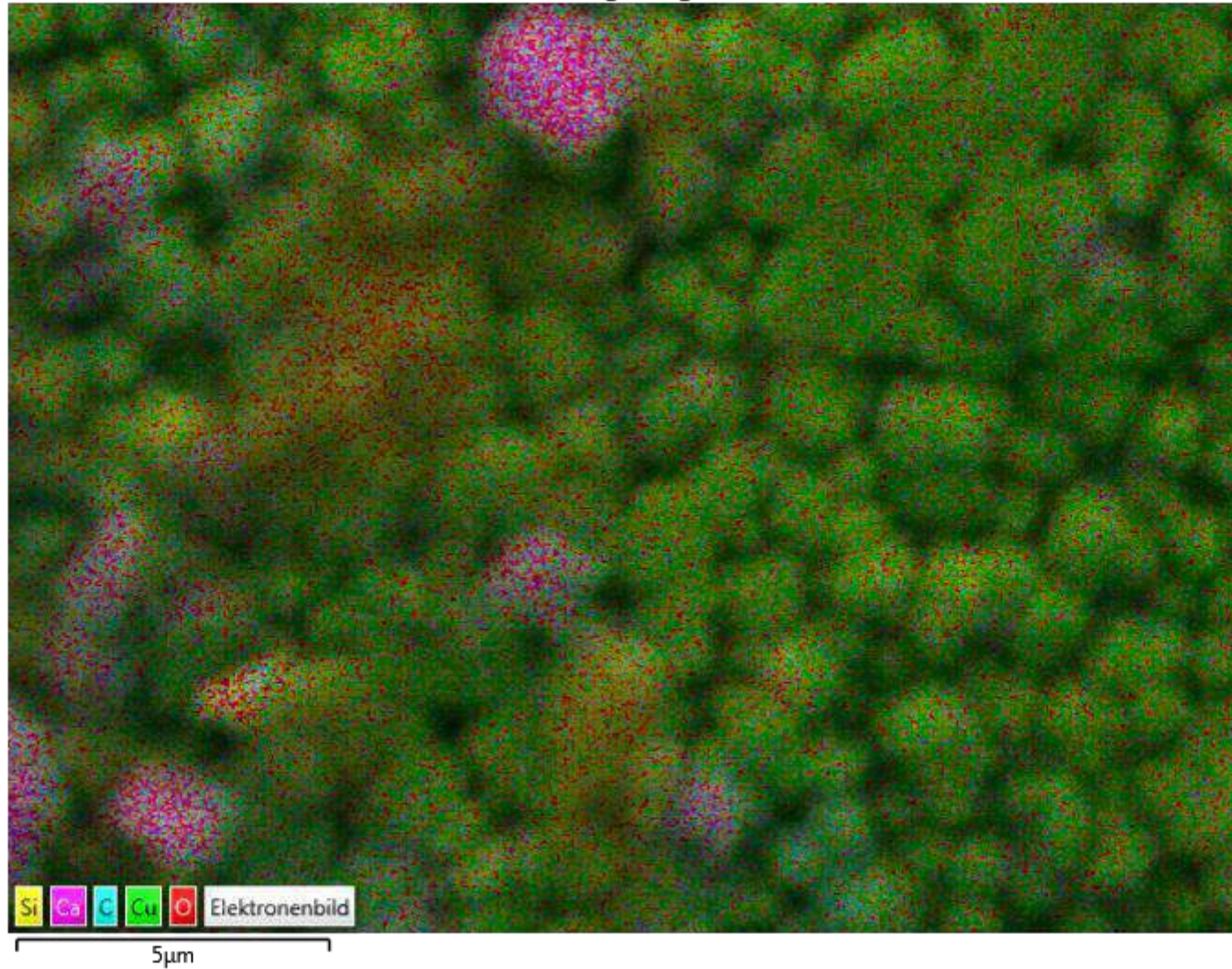
Elektronenbild 11

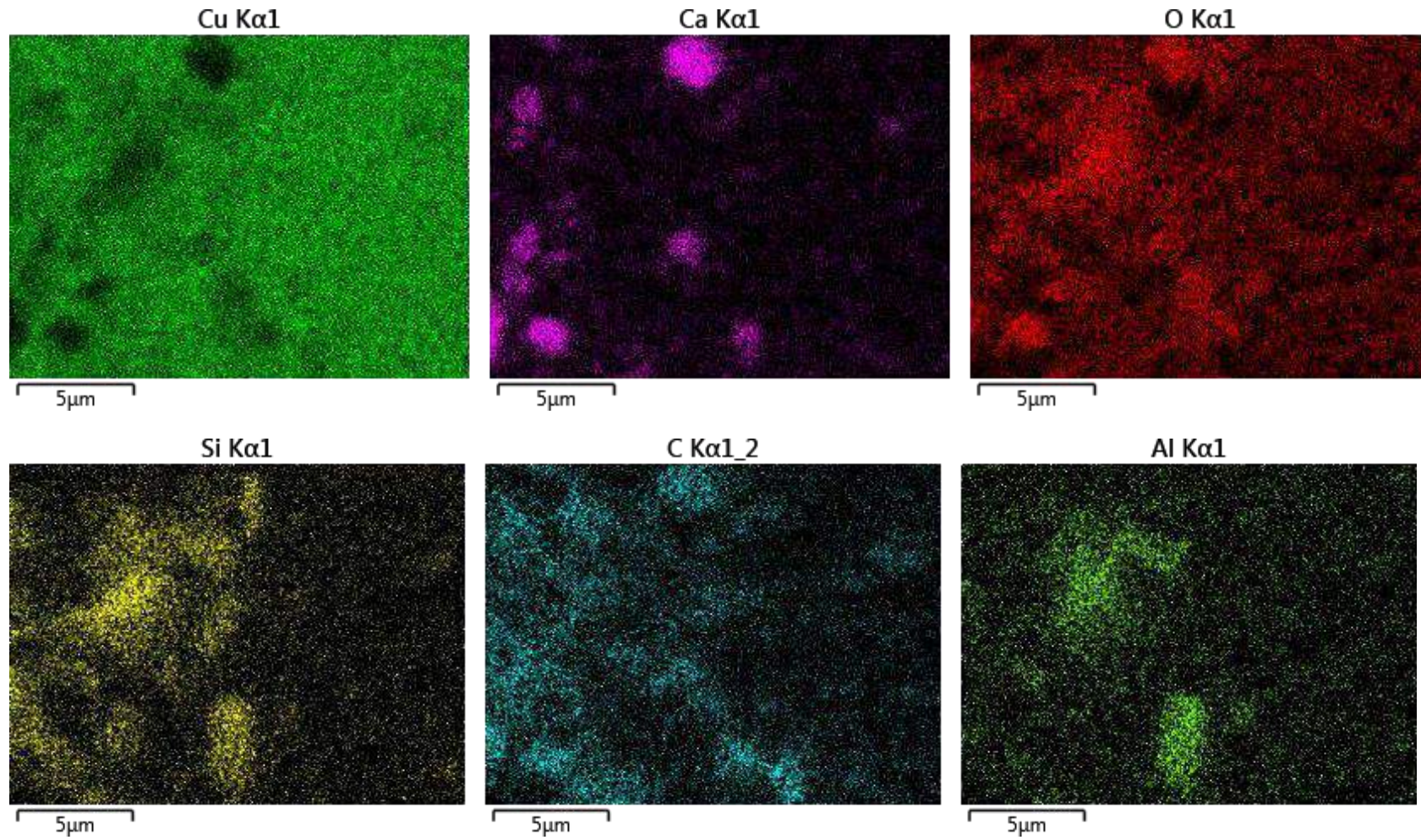


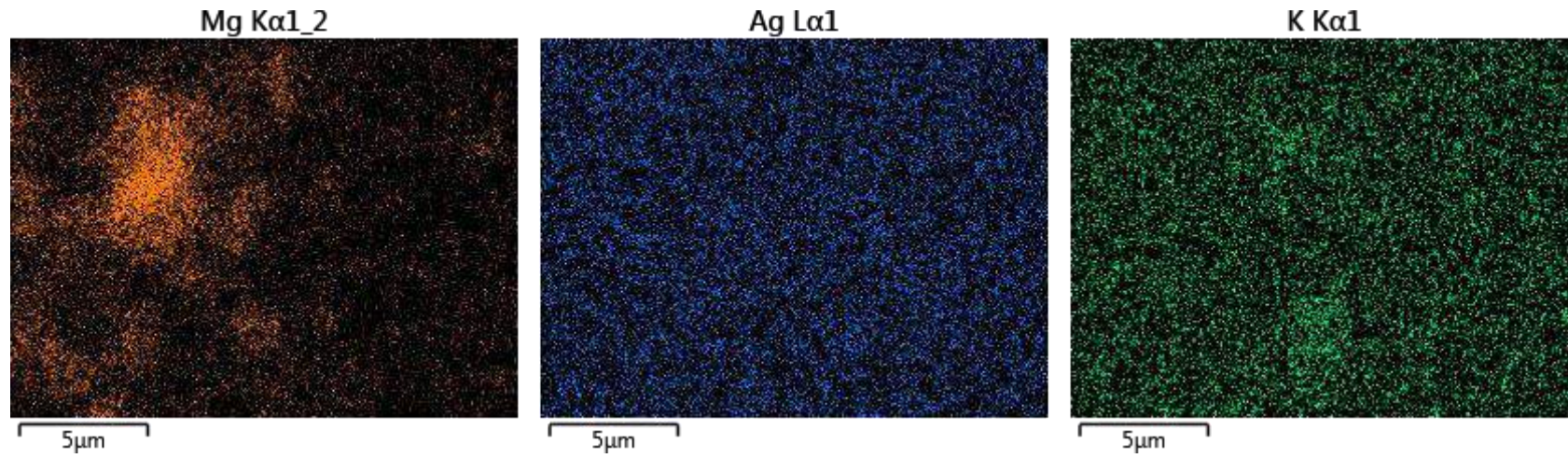
5µm

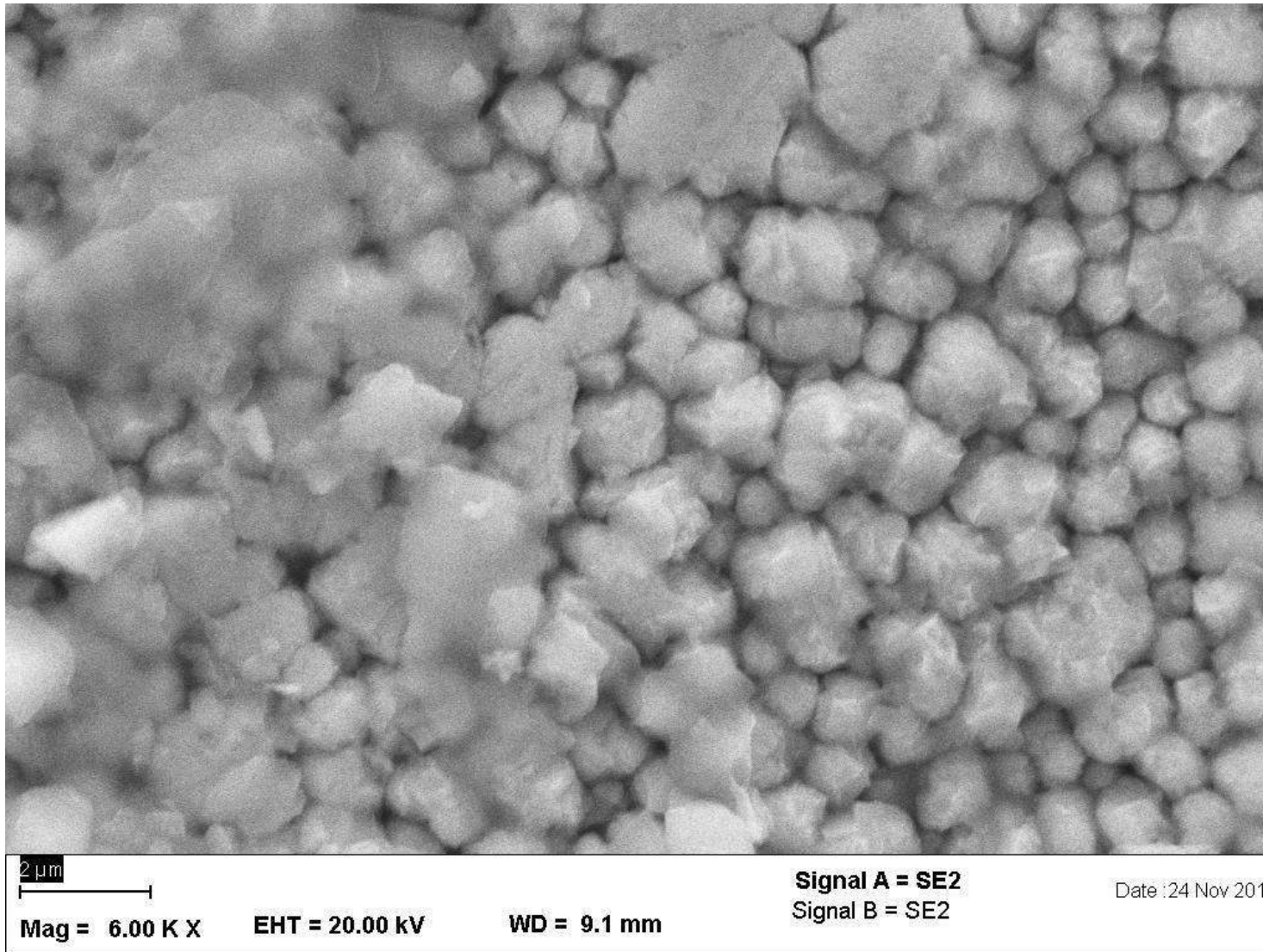


EDS-Überlagerungsbild 11



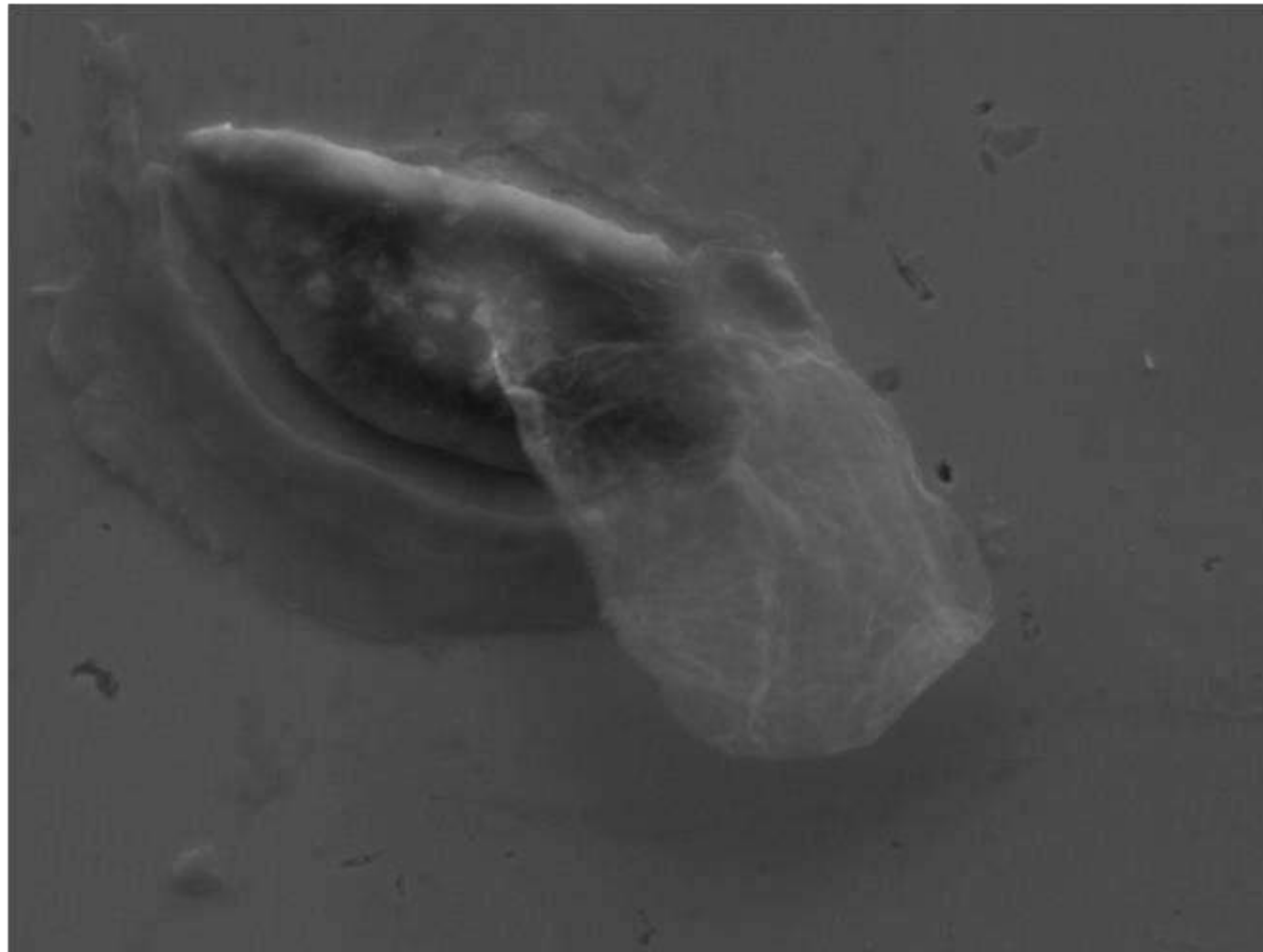






SEM image of Alloy 8a2 – Heat treatment “Black Satin” – Exp. 21

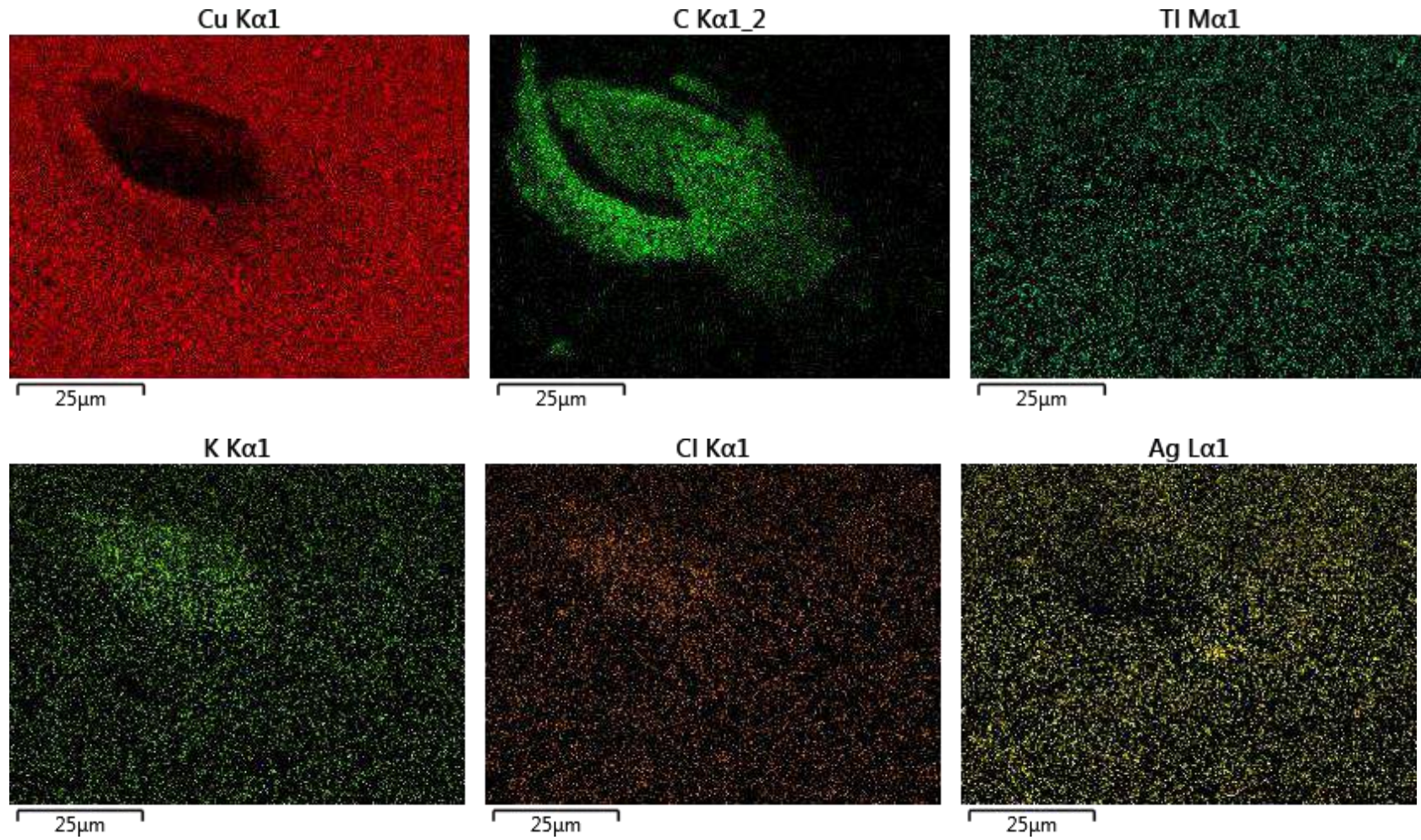
Elektronenbild 12

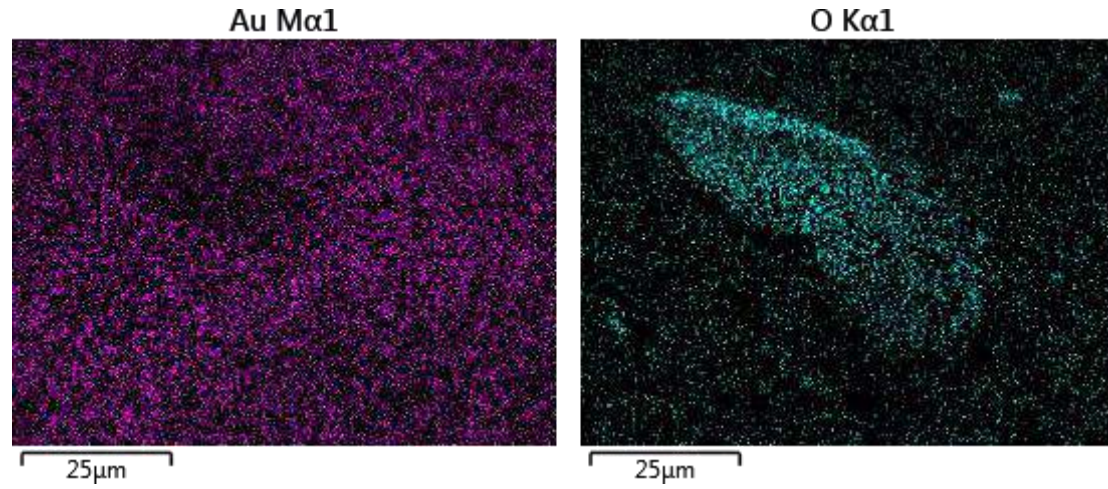


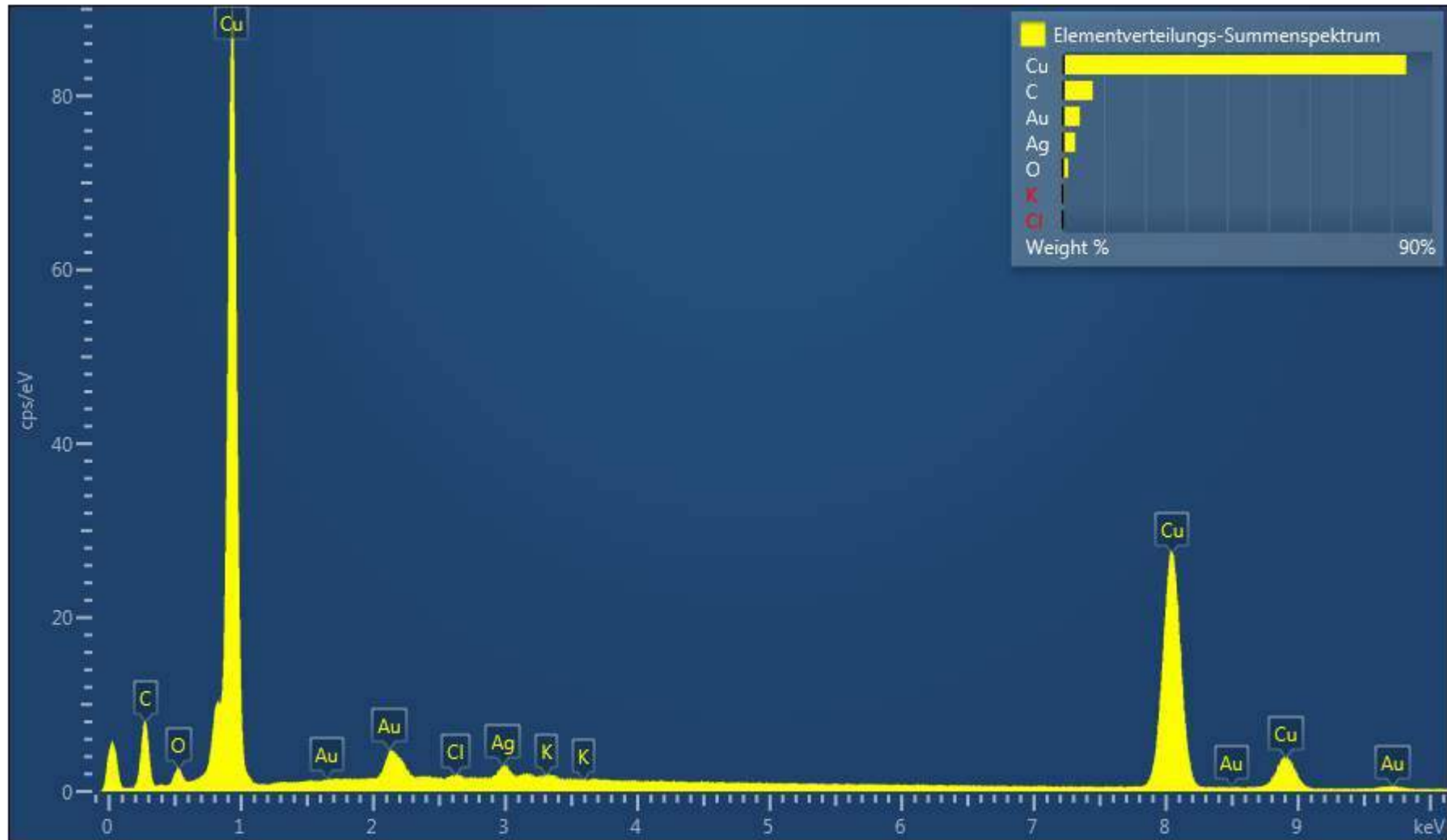
25µm

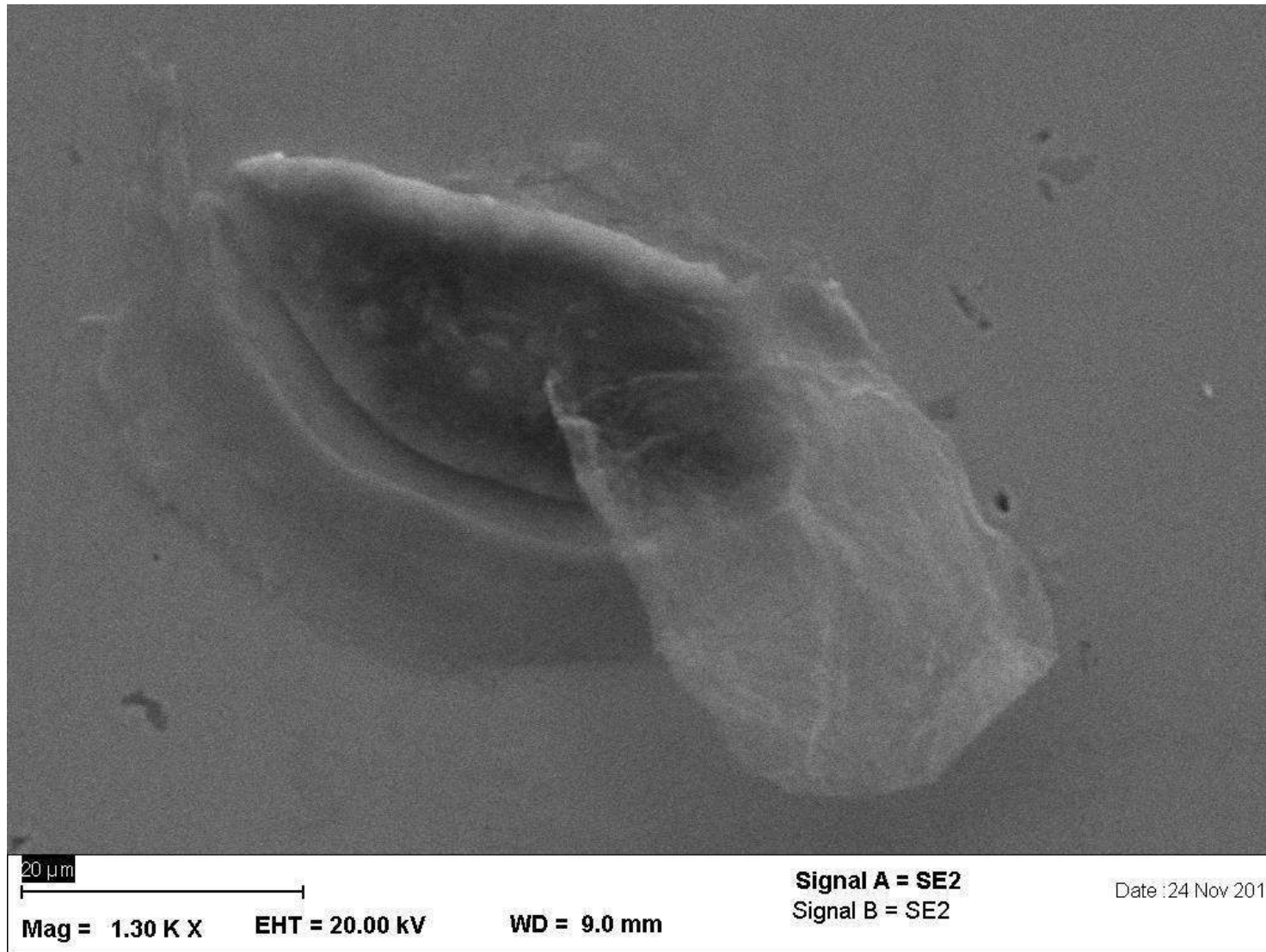
EDS-Überlagerungsbild 12



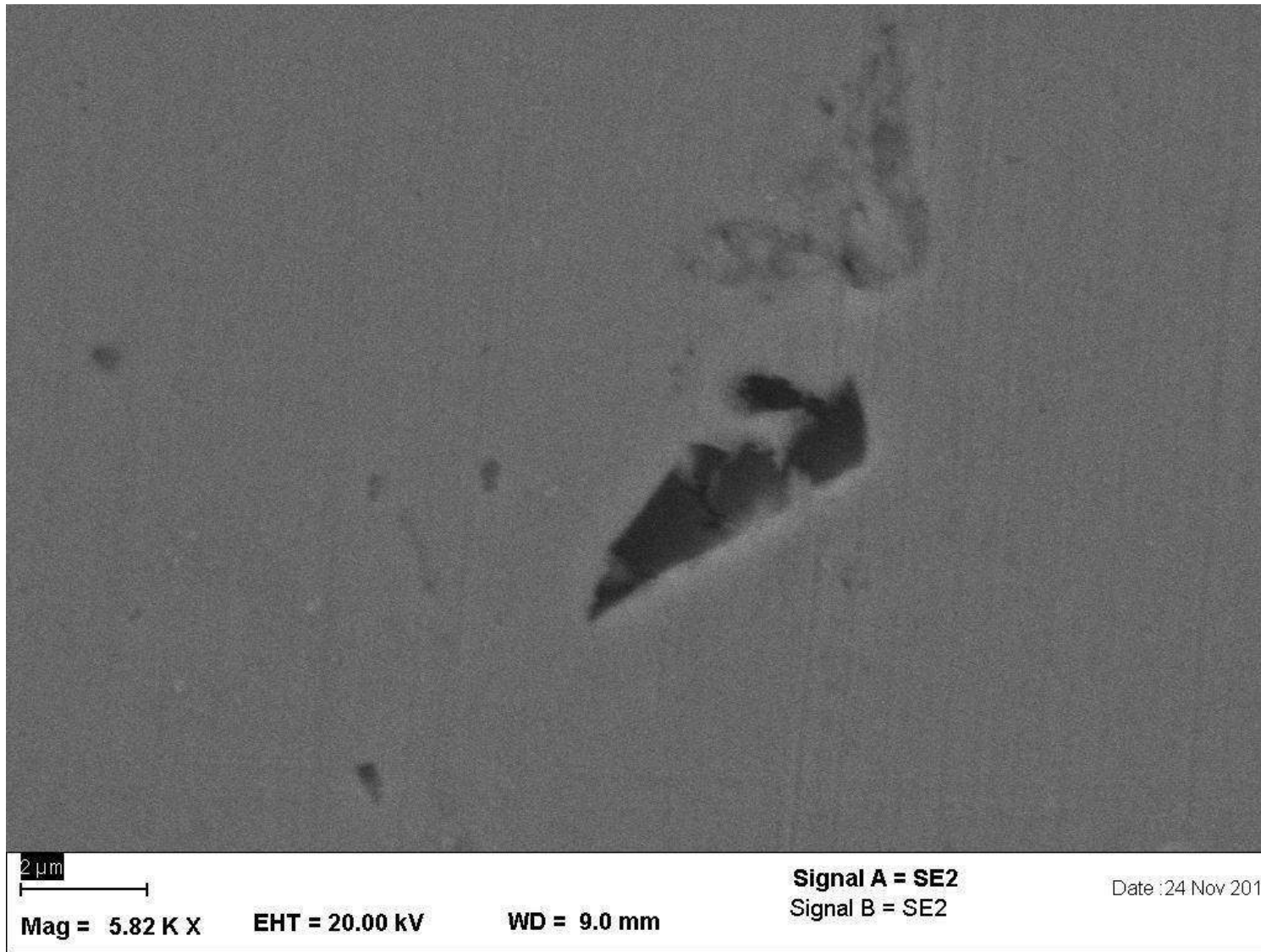








SEM image of Alloy 8a2 (unpatinated)



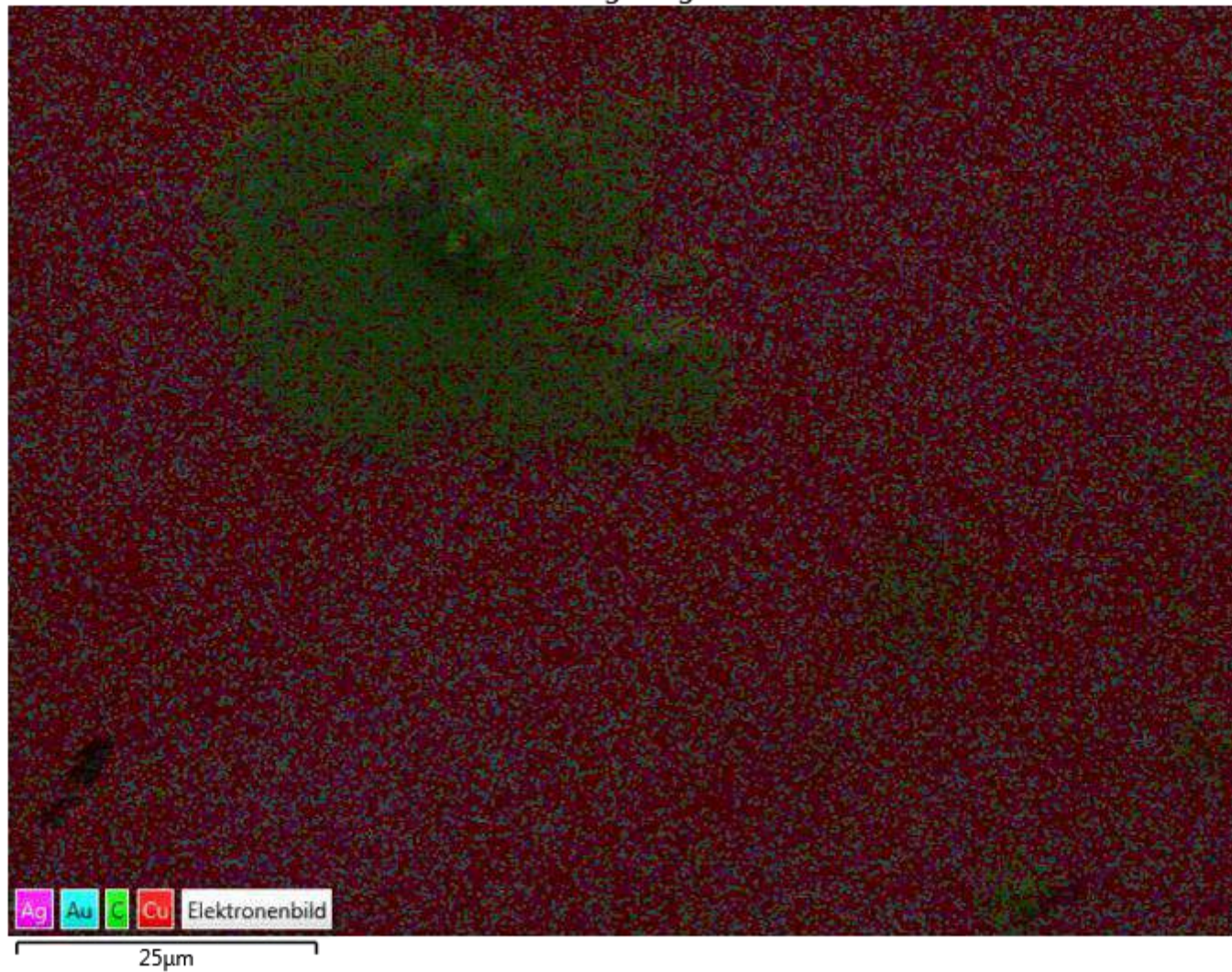
SEM image of Alloy 8a2 (unpatinated)

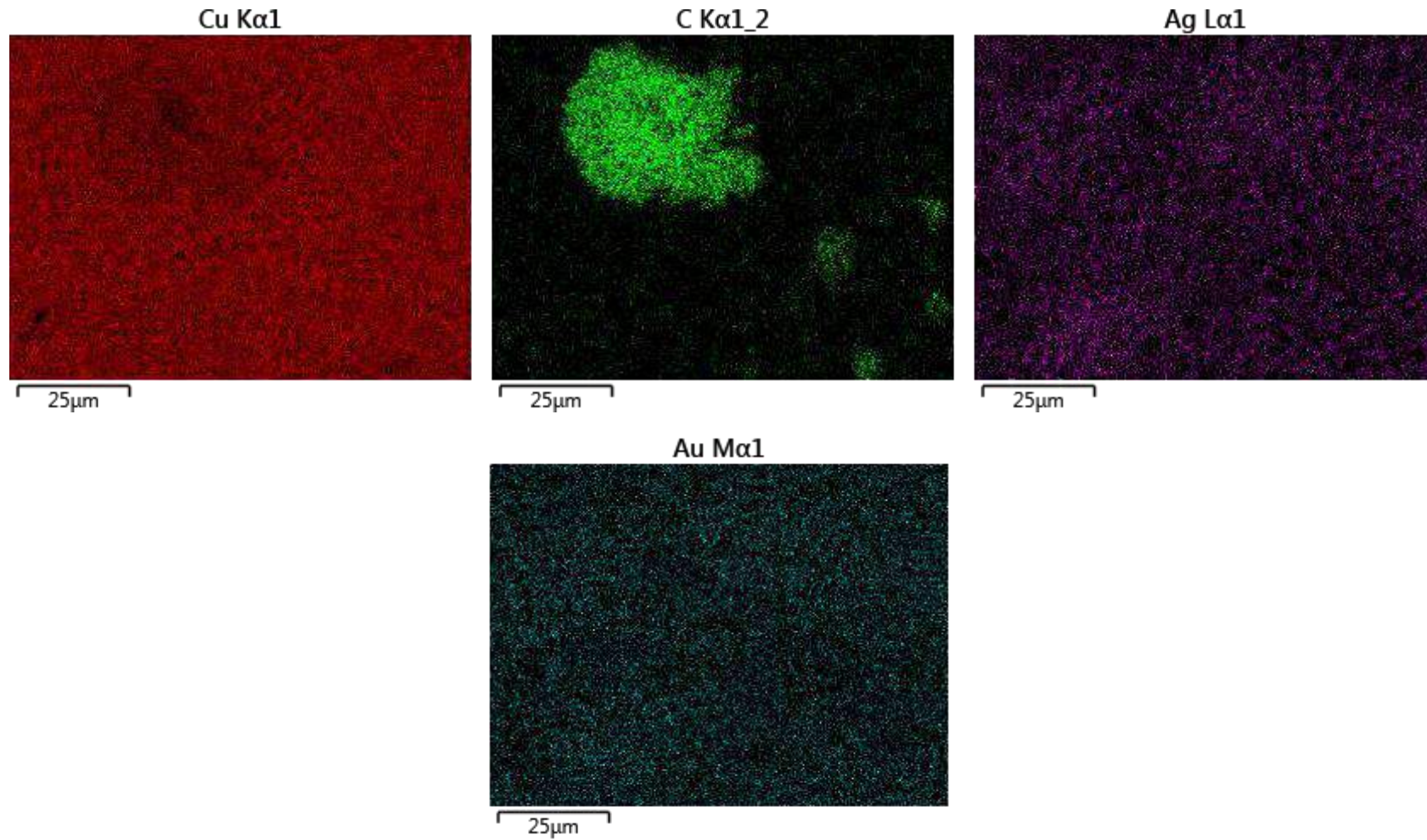
Elektronenbild 13

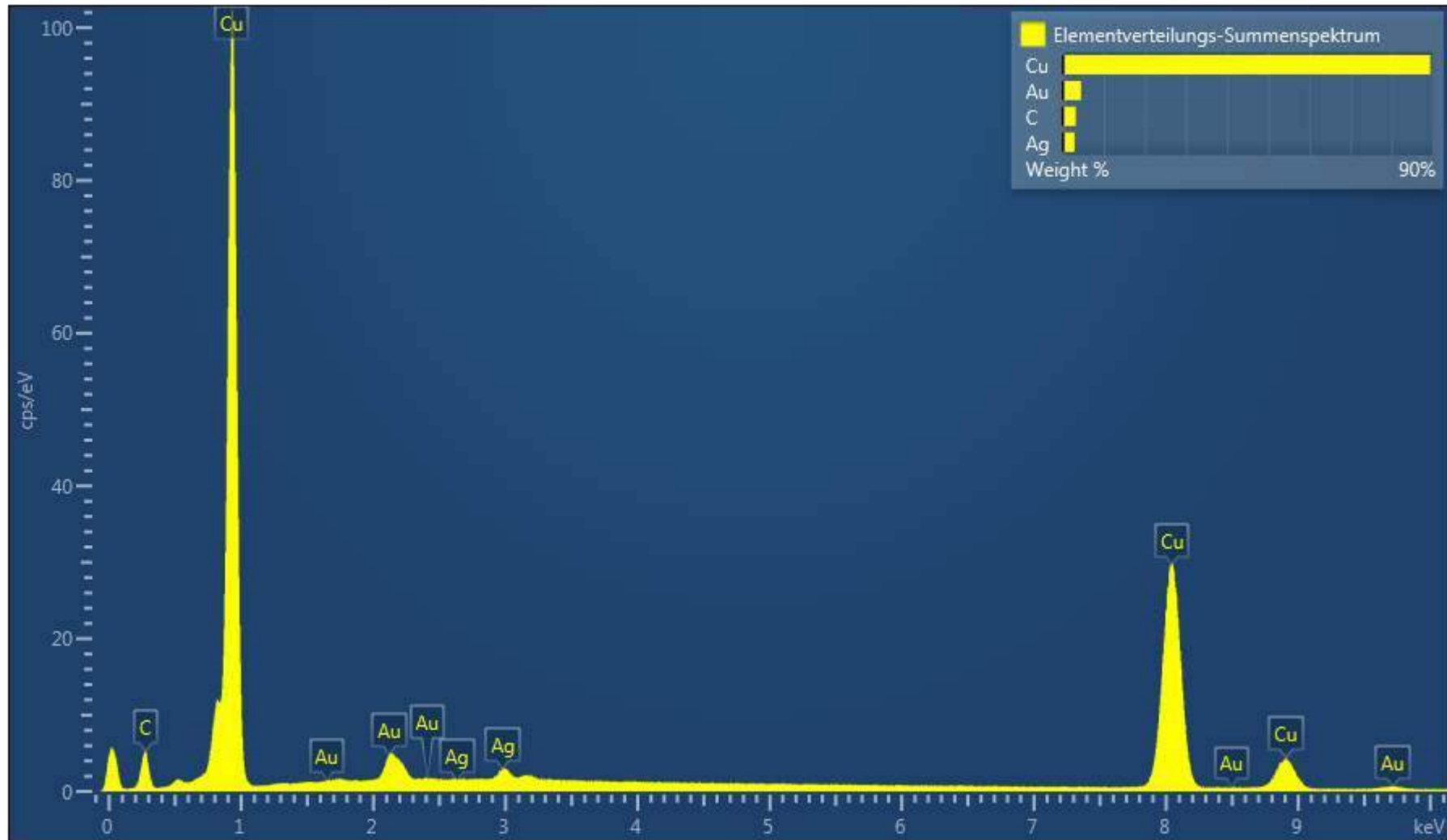


25µm

EDS-Überlagerungsbild 13





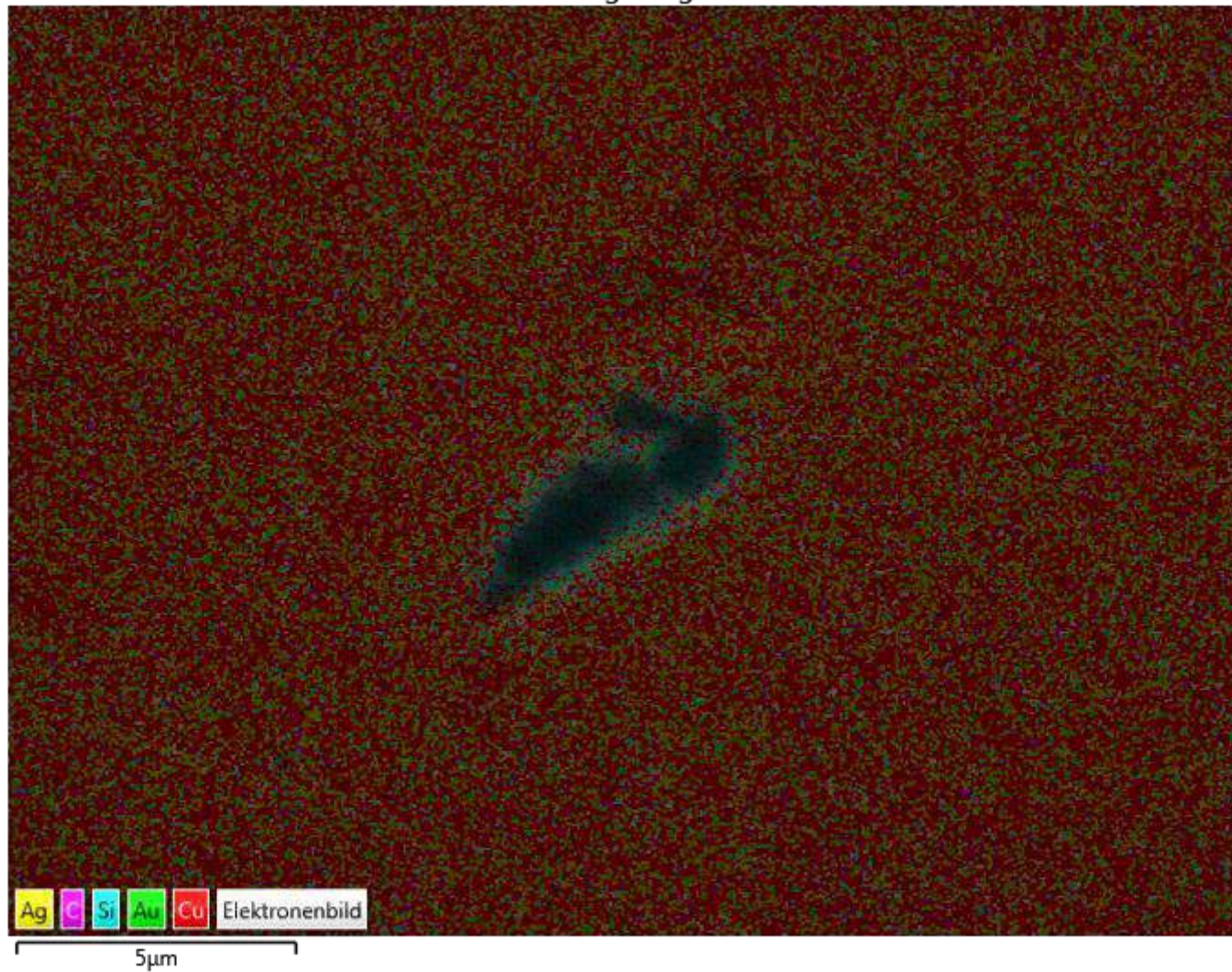


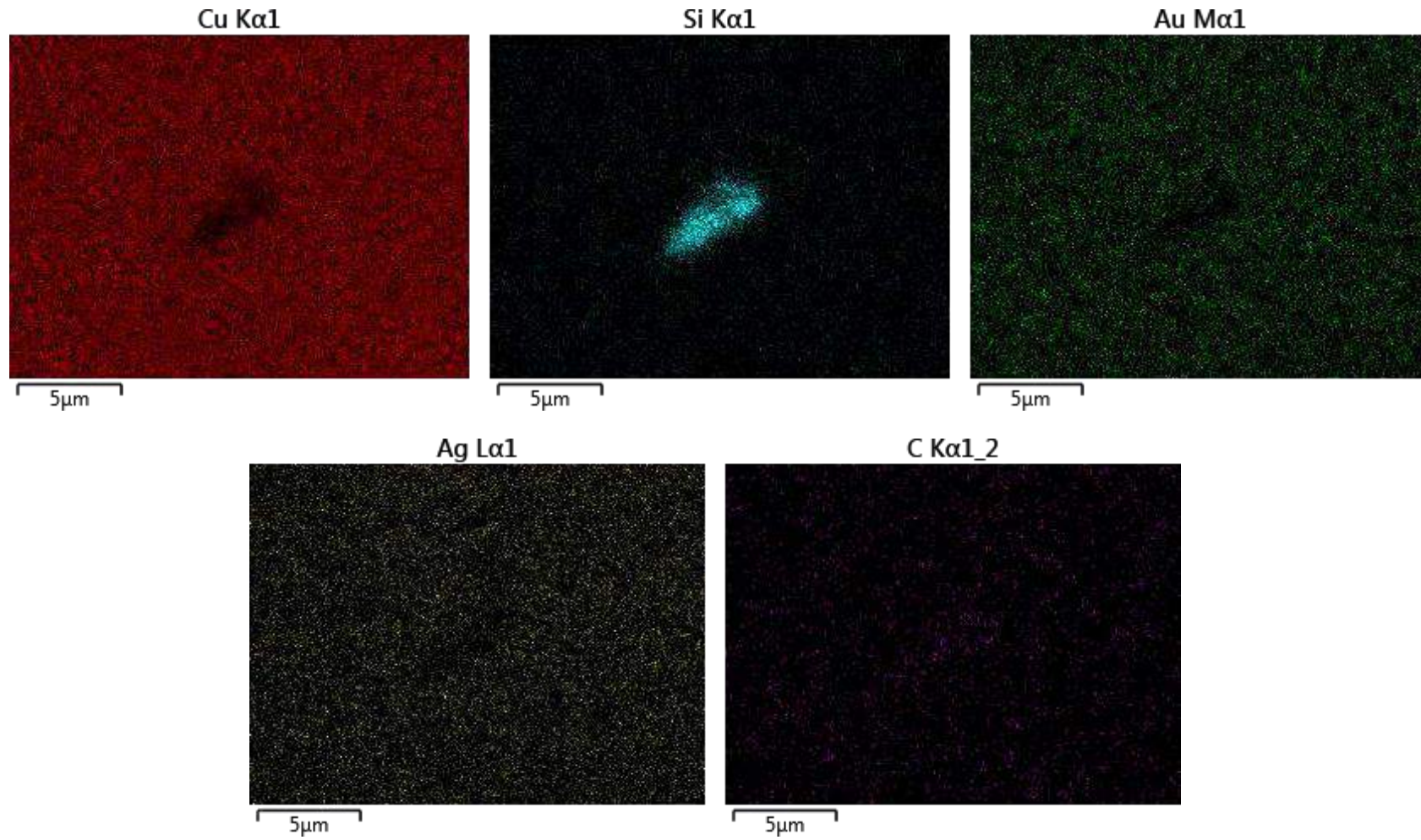
Elektronenbild 14

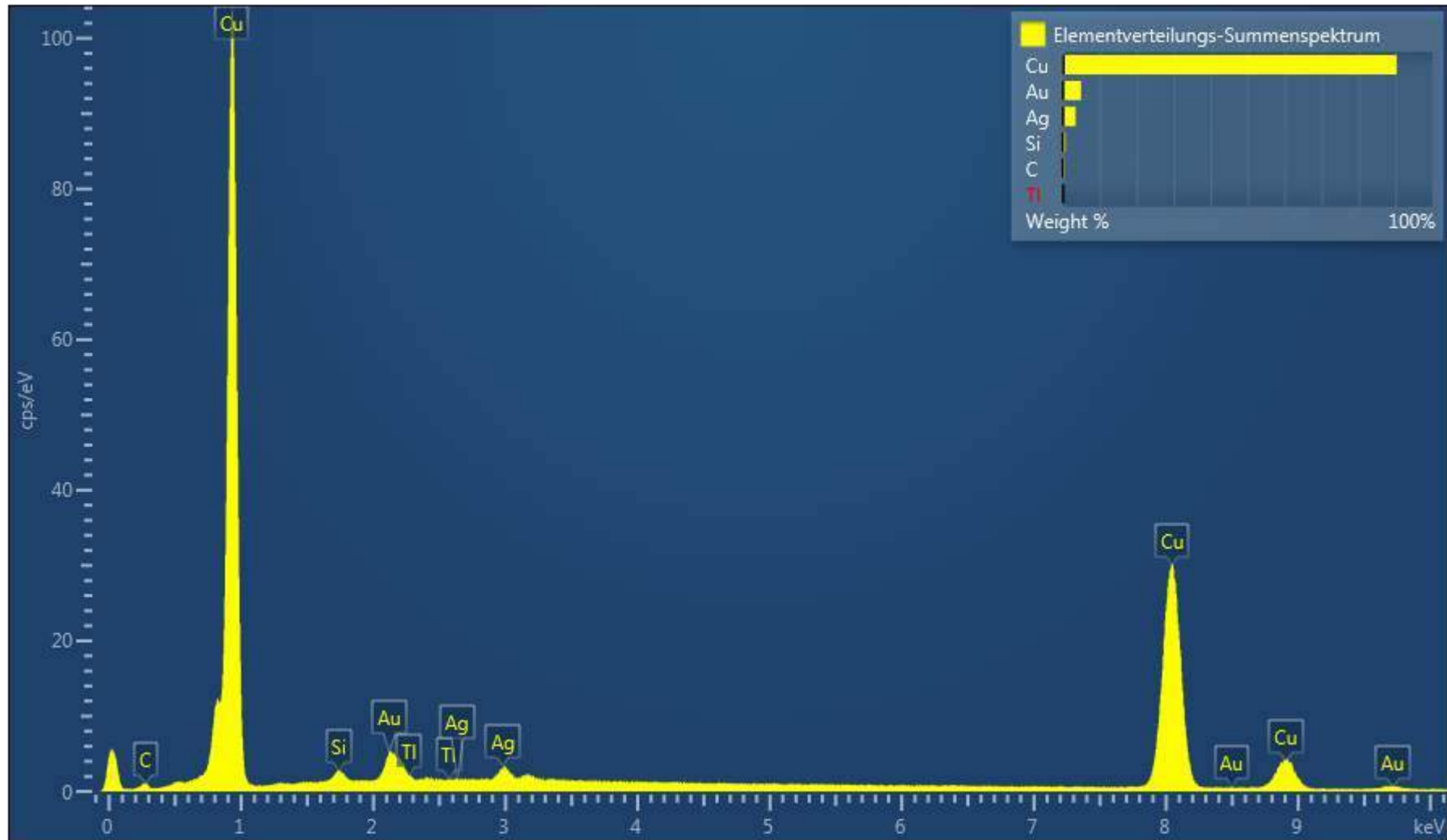


5µm

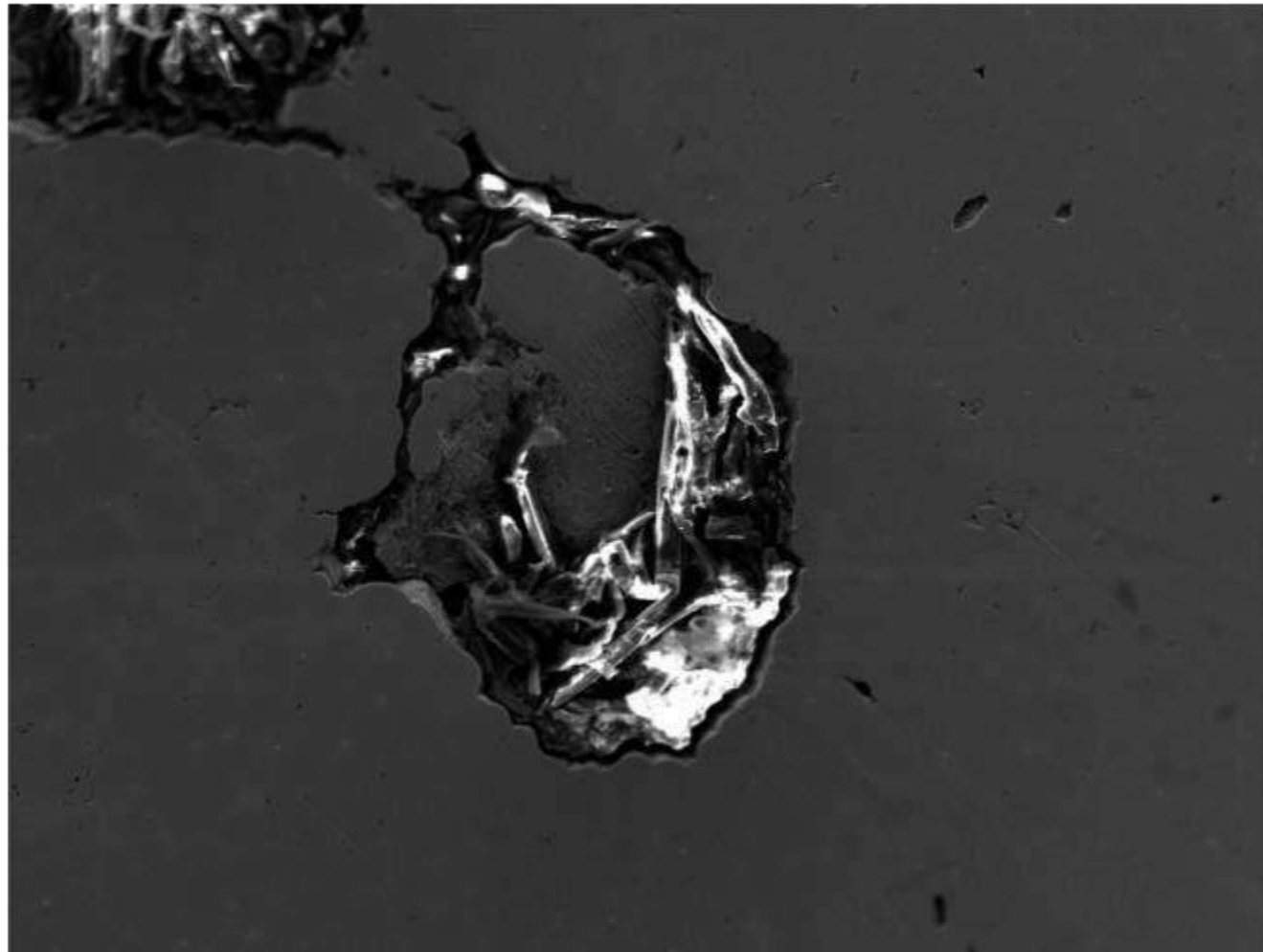
EDS-Überlagerungsbild 14





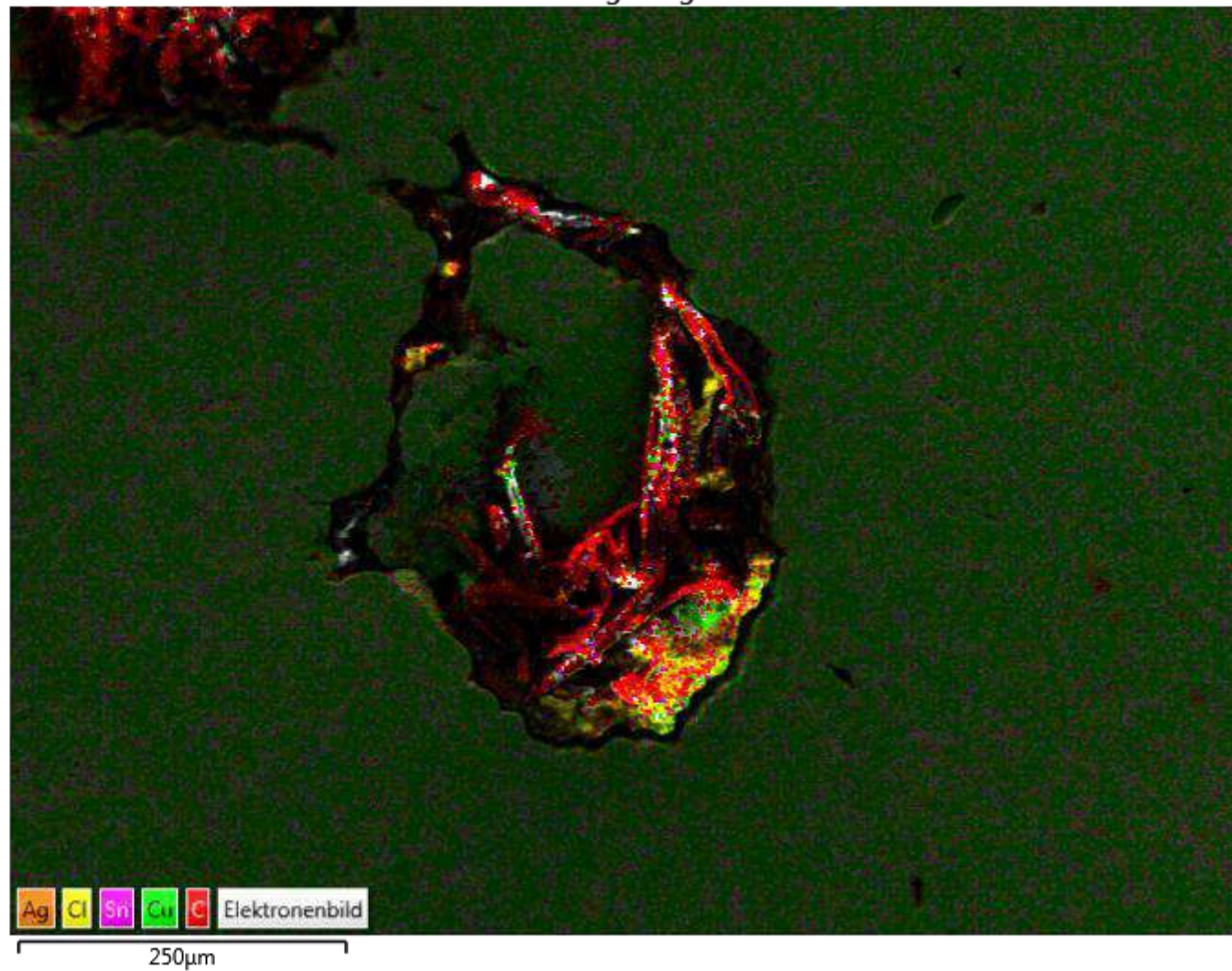


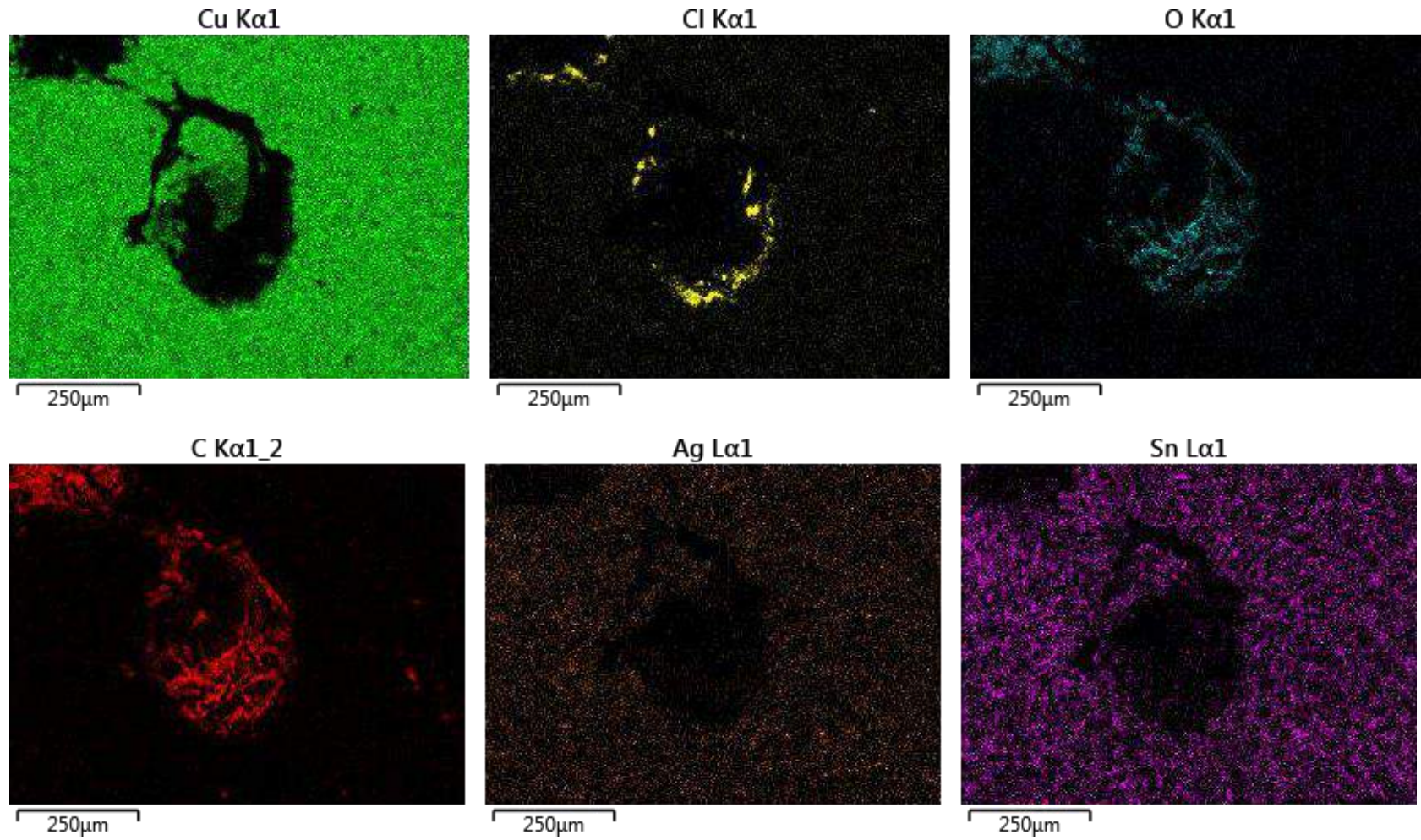
Elektronenbild 15



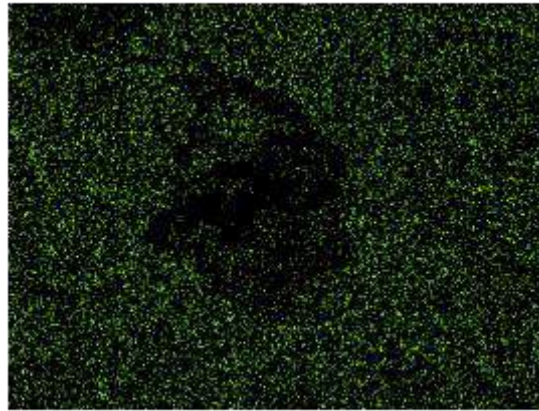
250µm

EDS-Überlagerungsbild 15

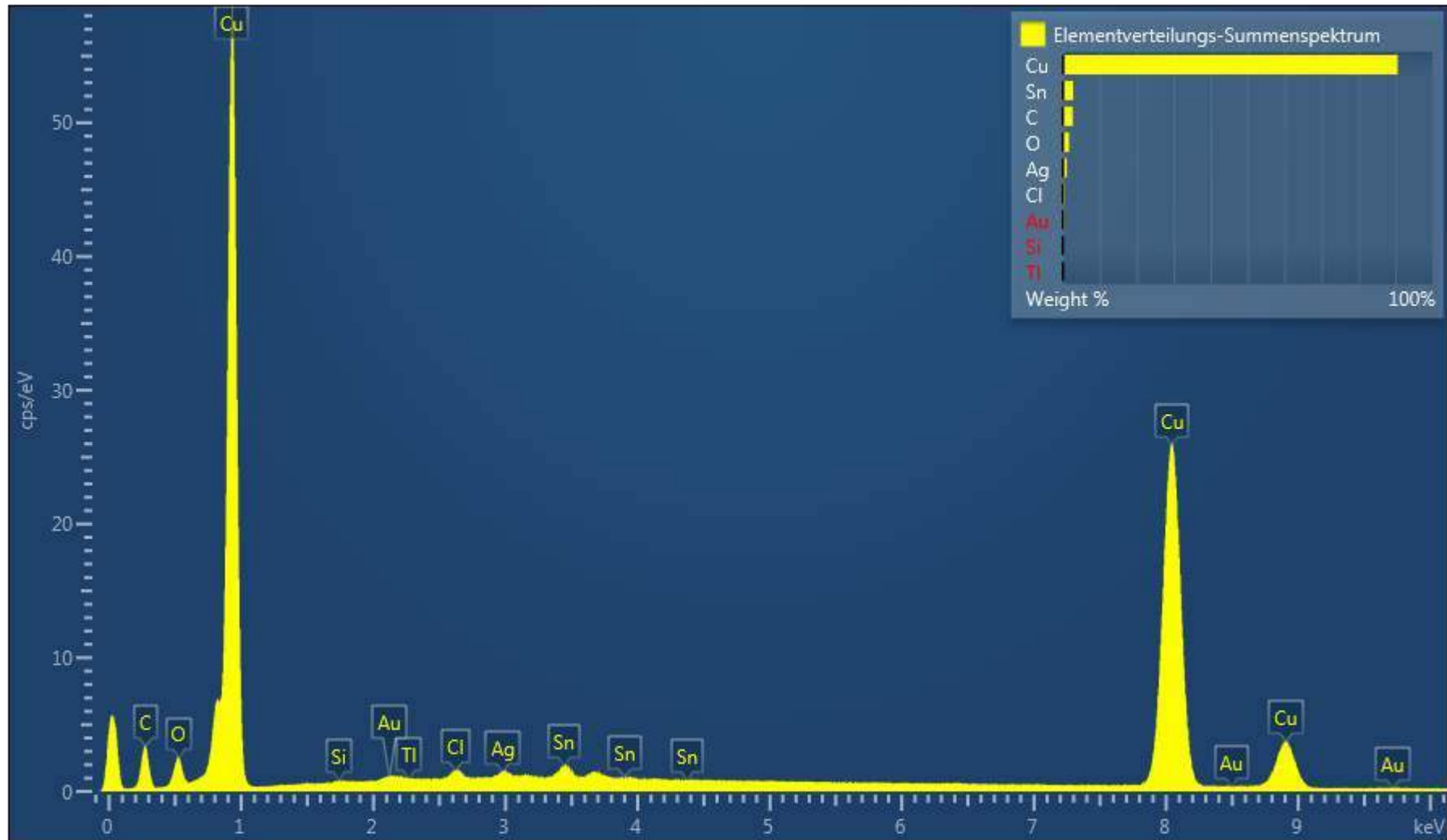


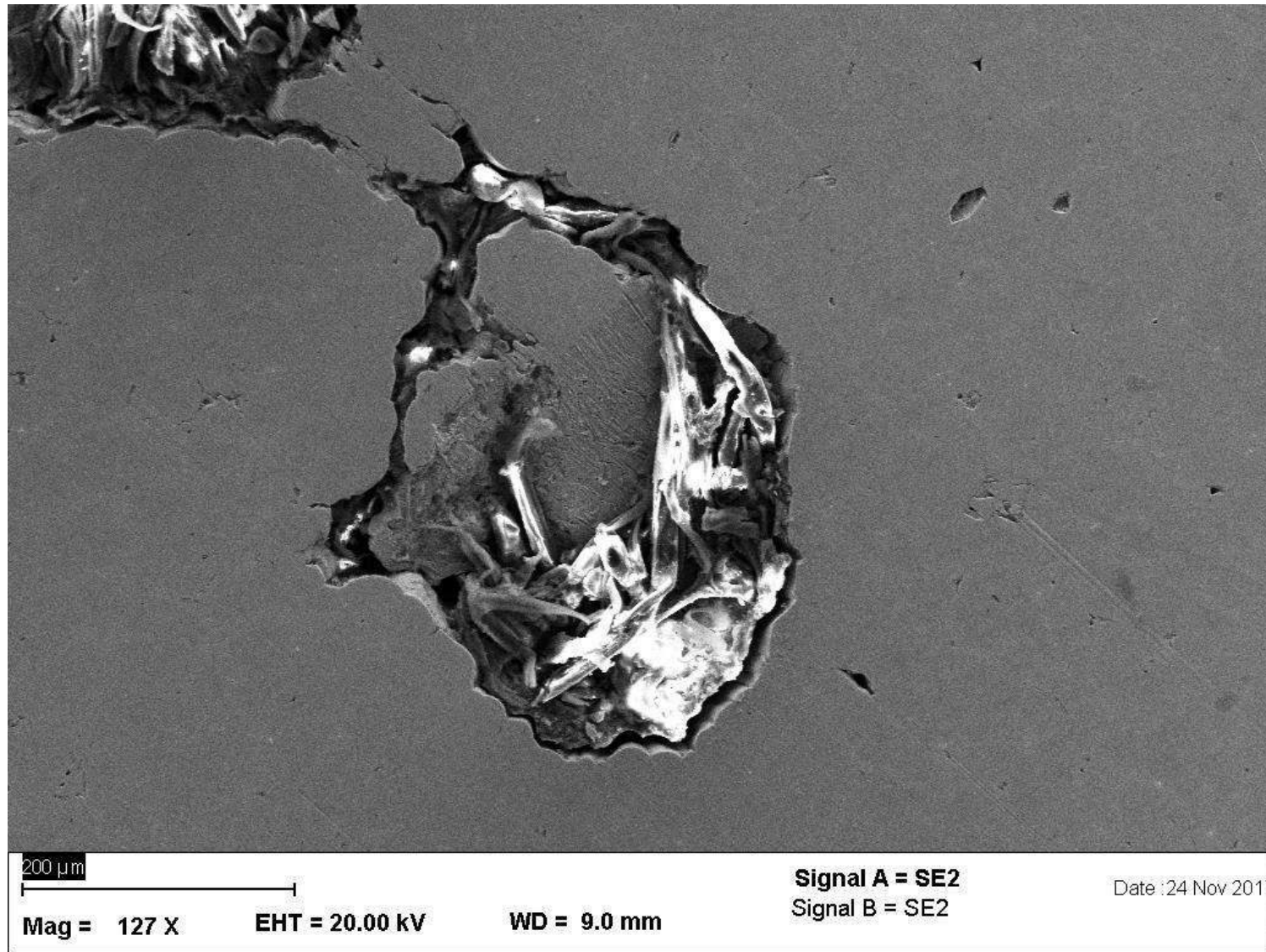


Au Mα1

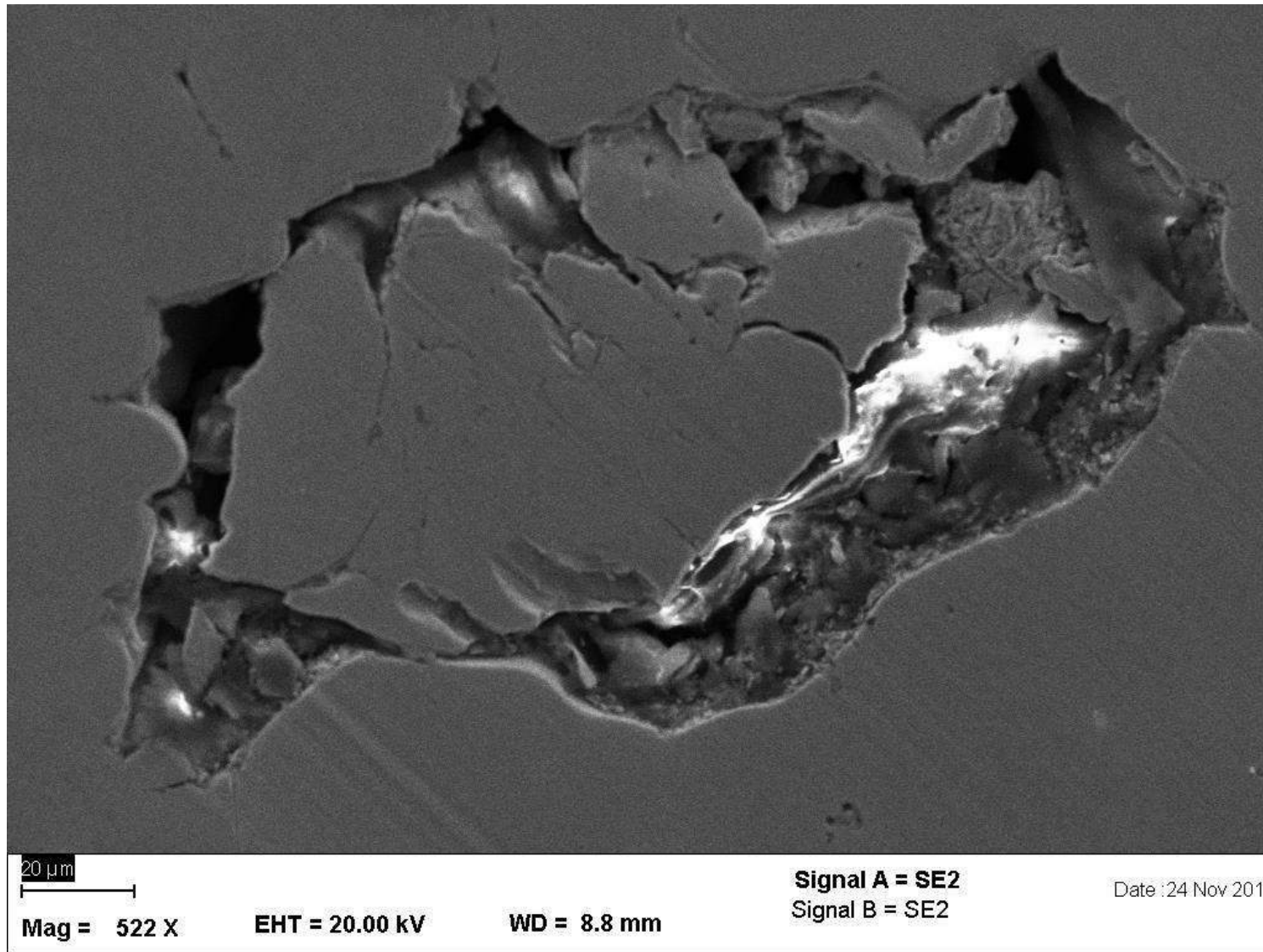


250μm



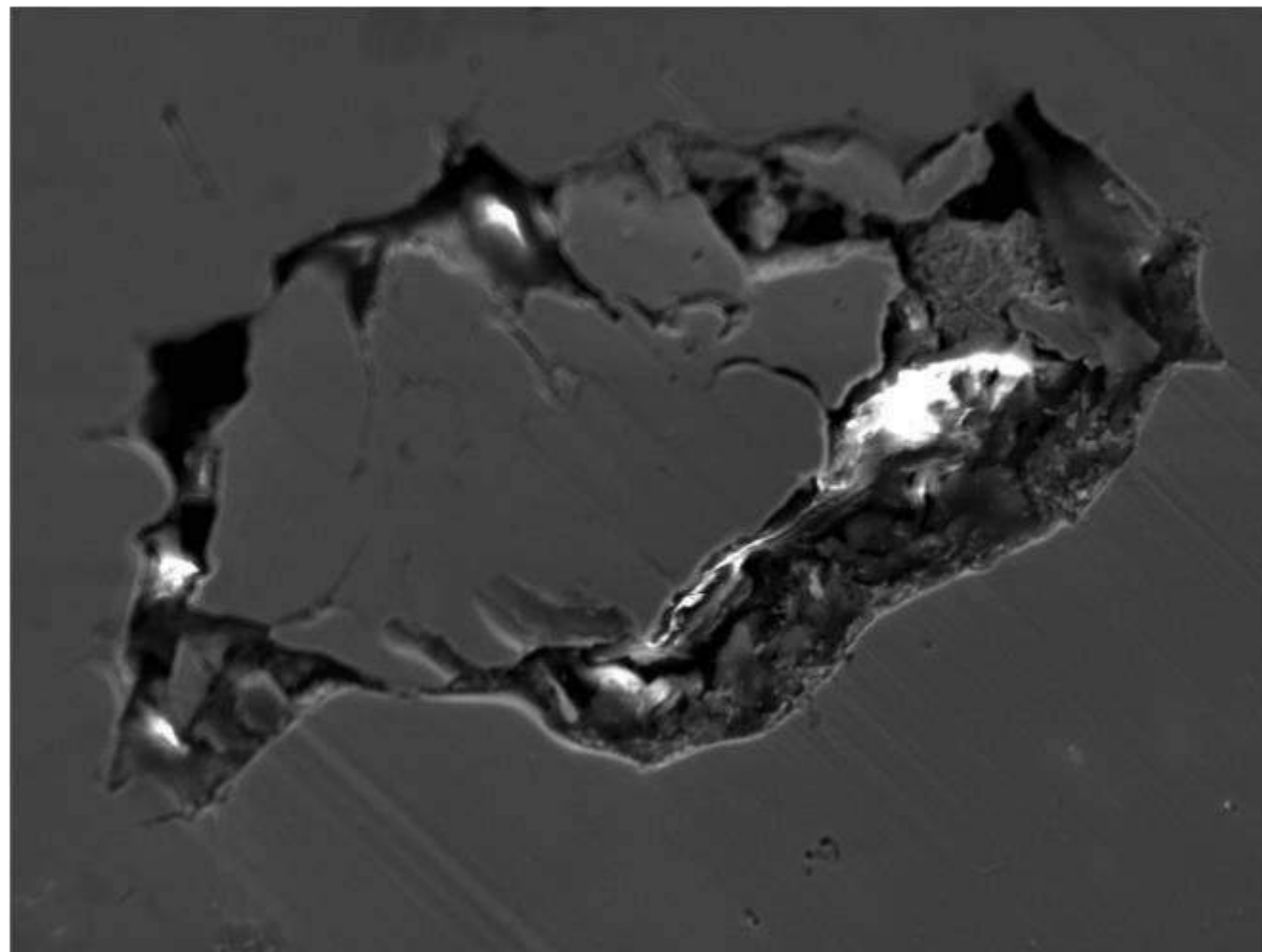


SEM image of Alloy 5a2 (unpatinated)



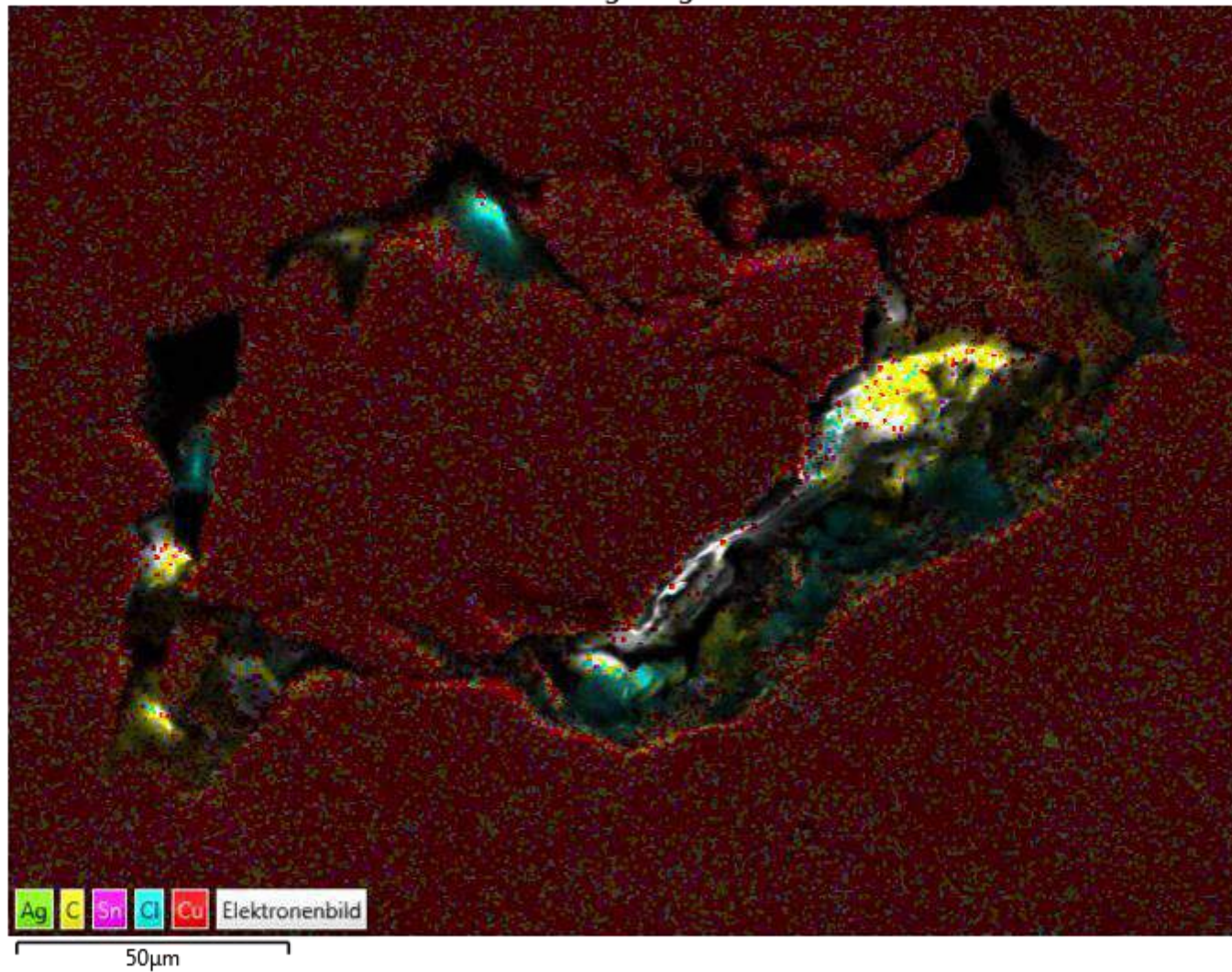
SEM image of Alloy 5a2 (unpatinated)

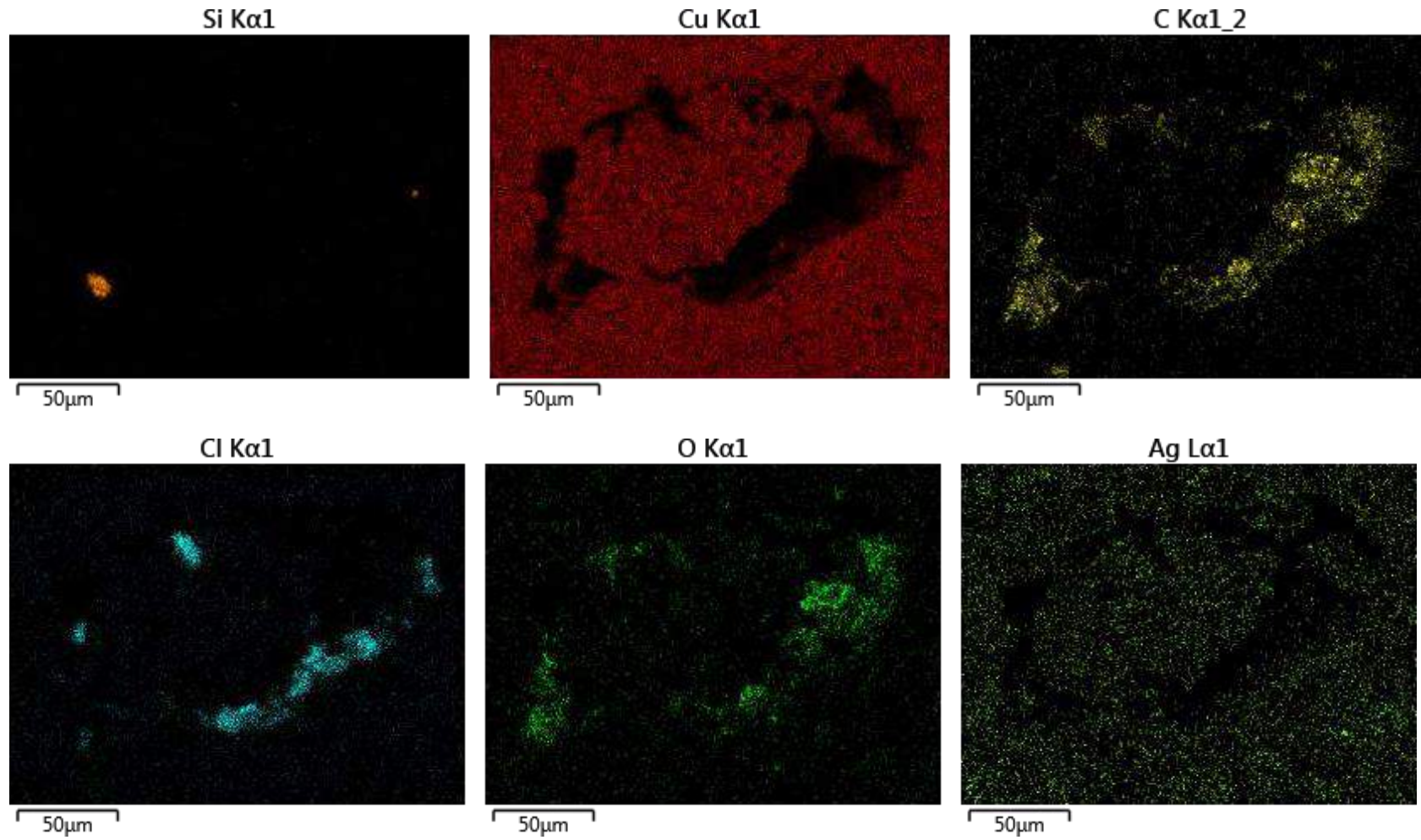
Elektronenbild 16



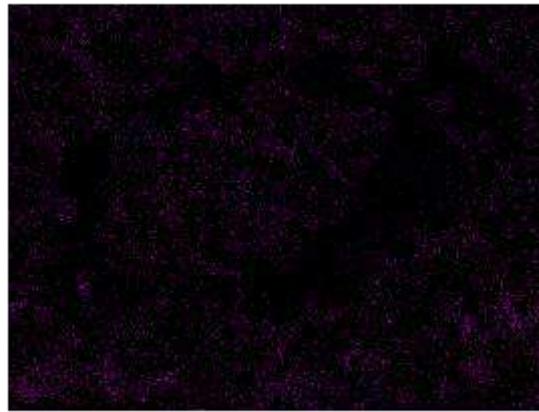
50µm

EDS-Überlagerungsbild 16

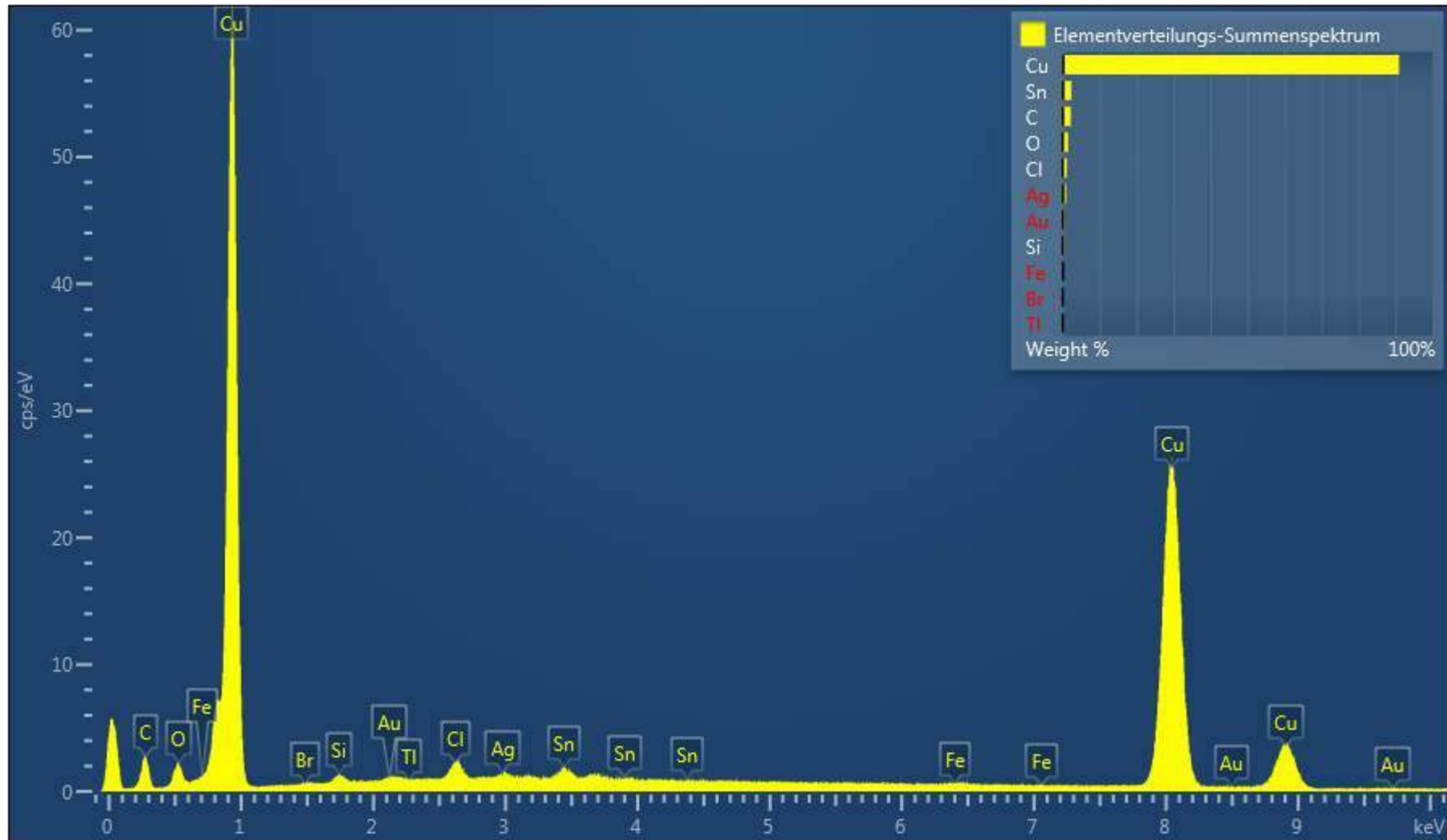




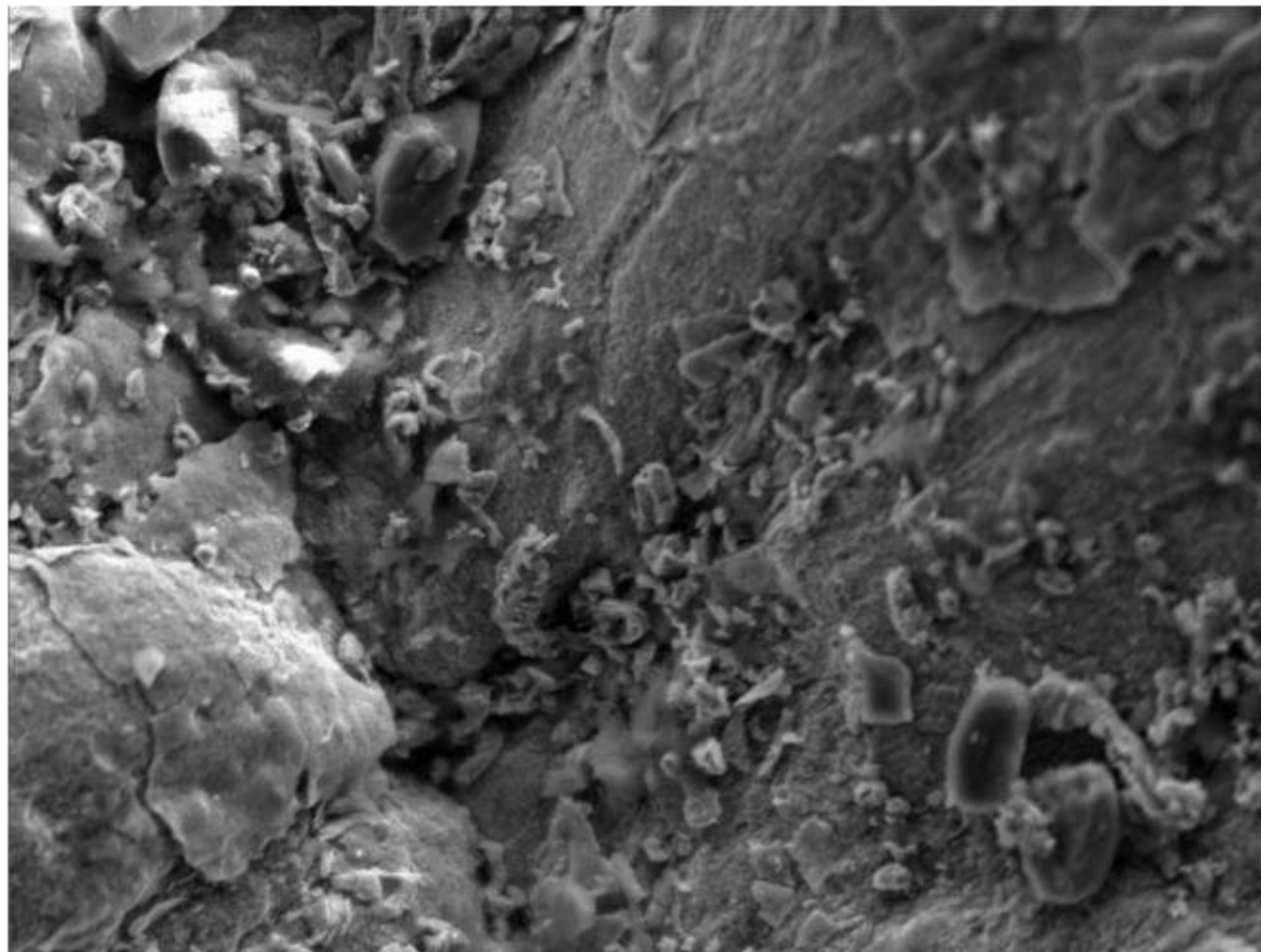
Sn L α 1



50 μ m

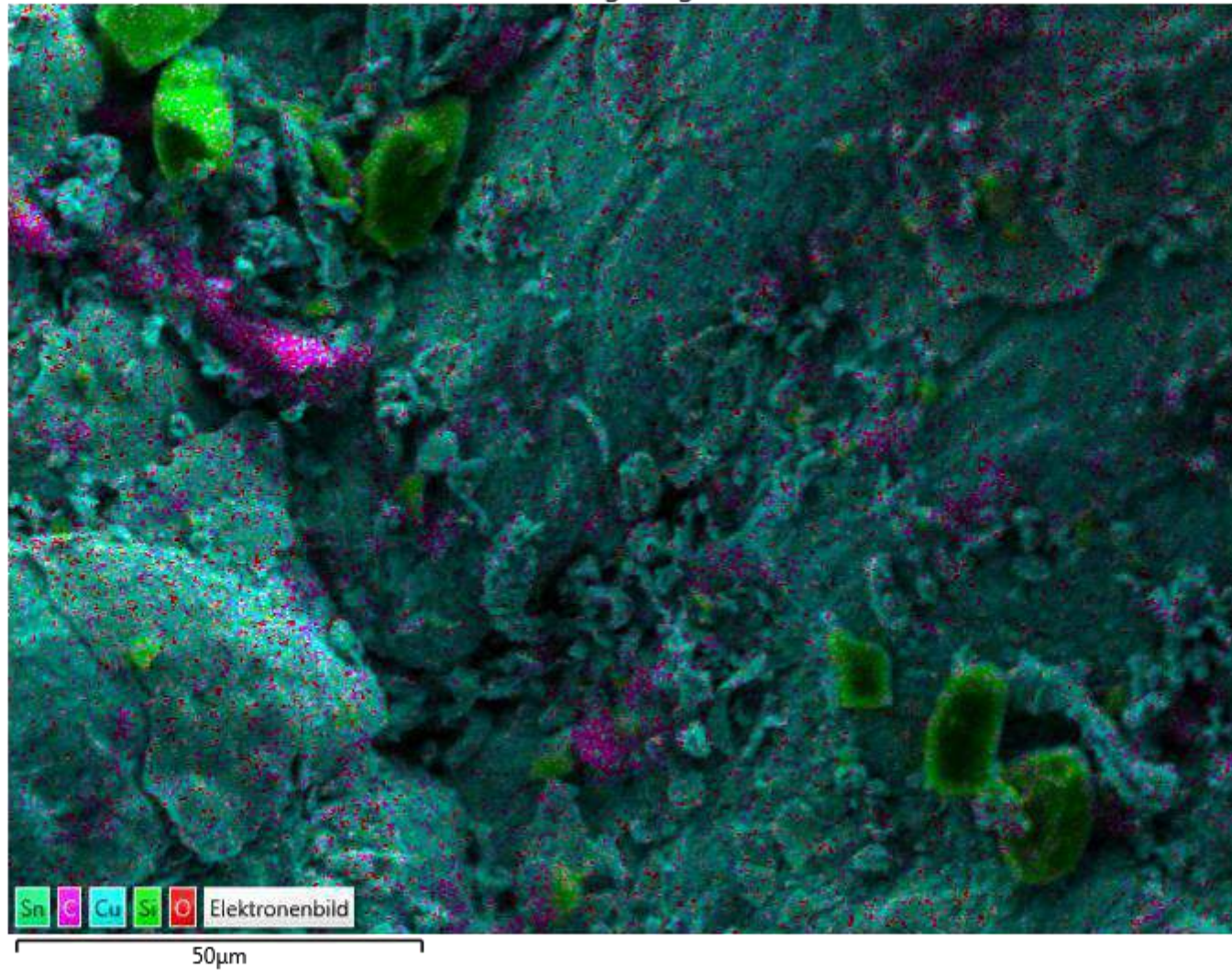


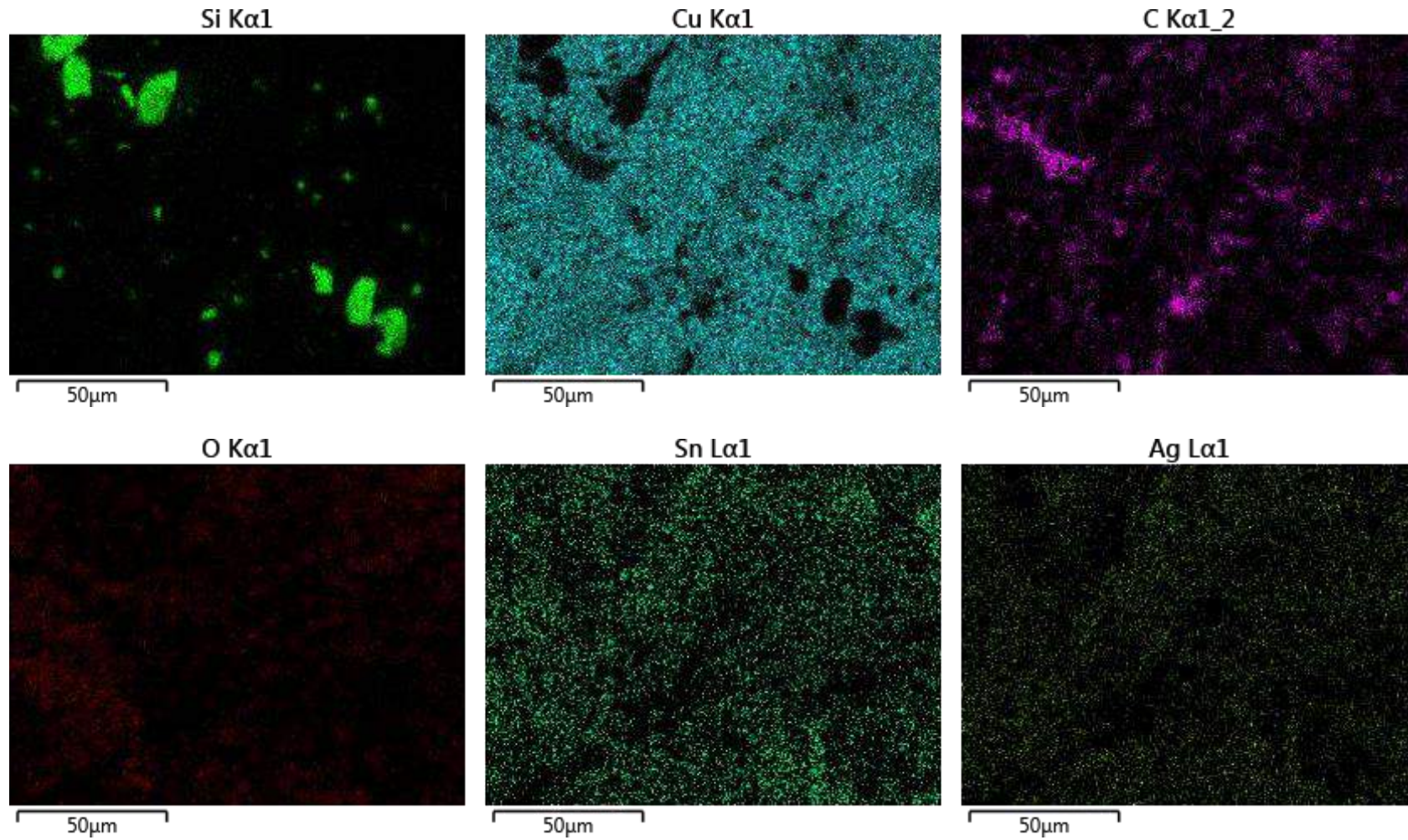
Elektronenbild 17

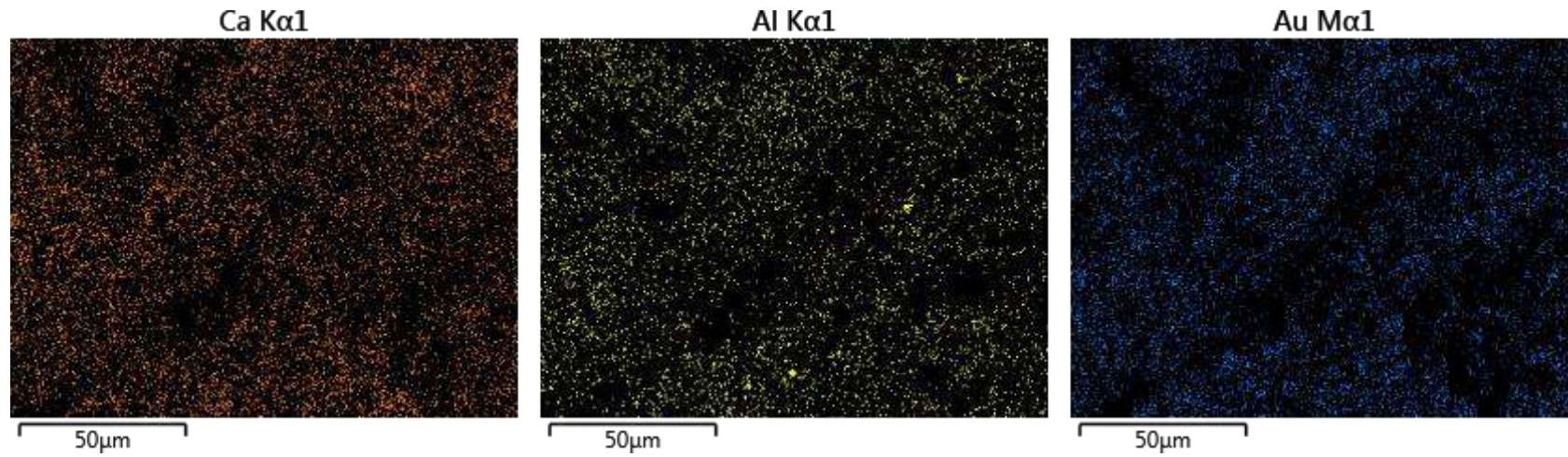


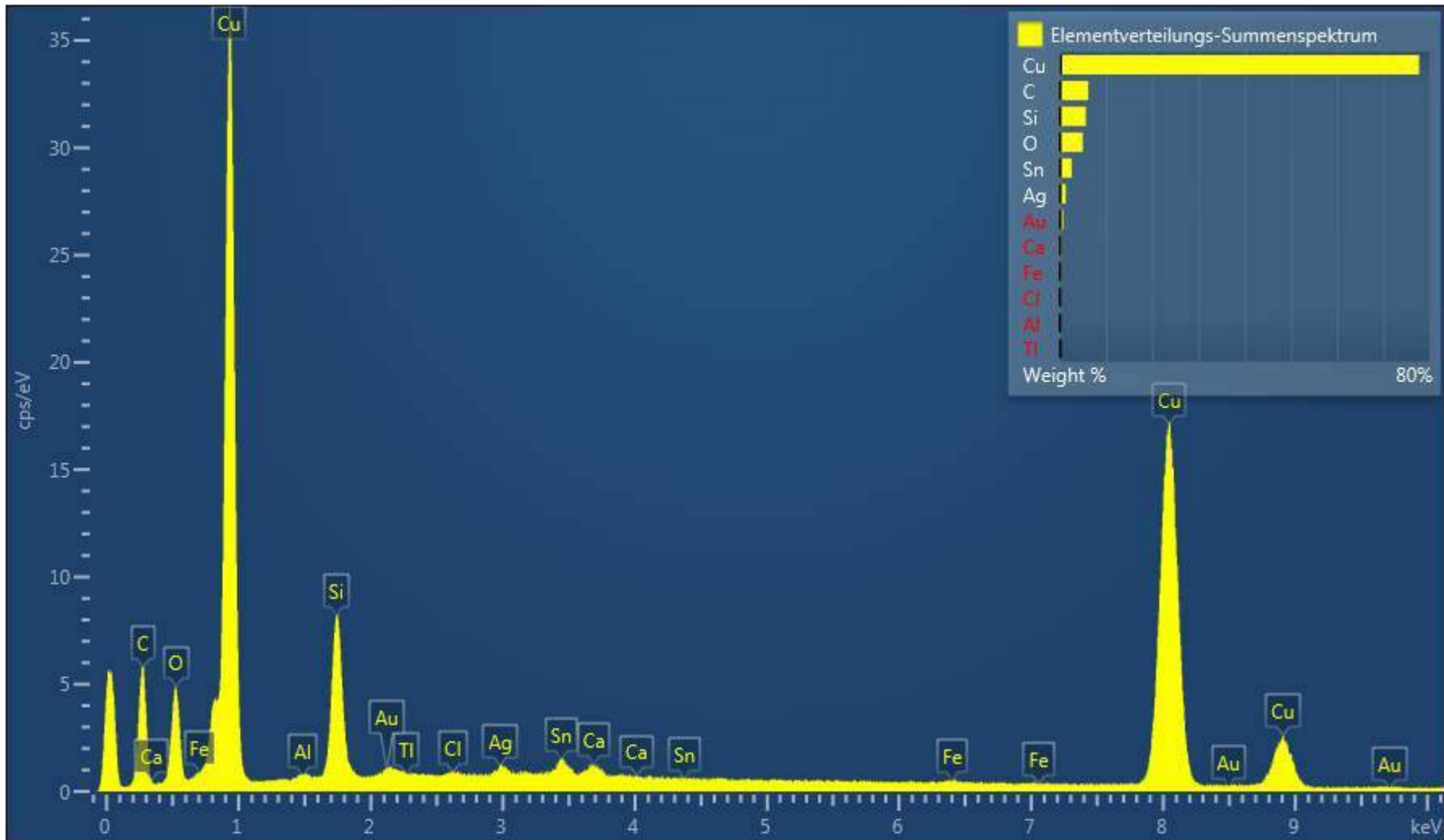
50µm

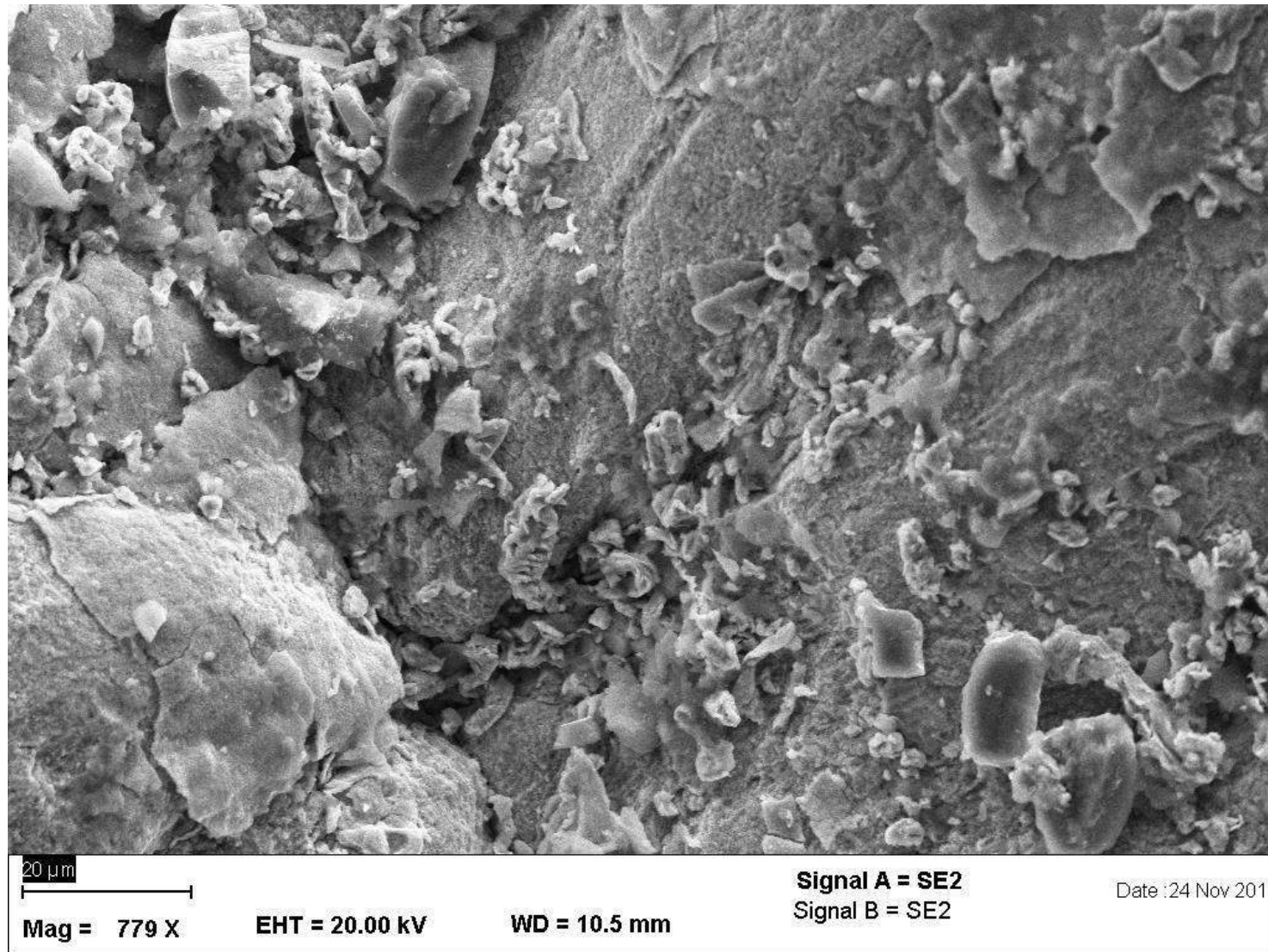
EDS-Überlagerungsbild 17



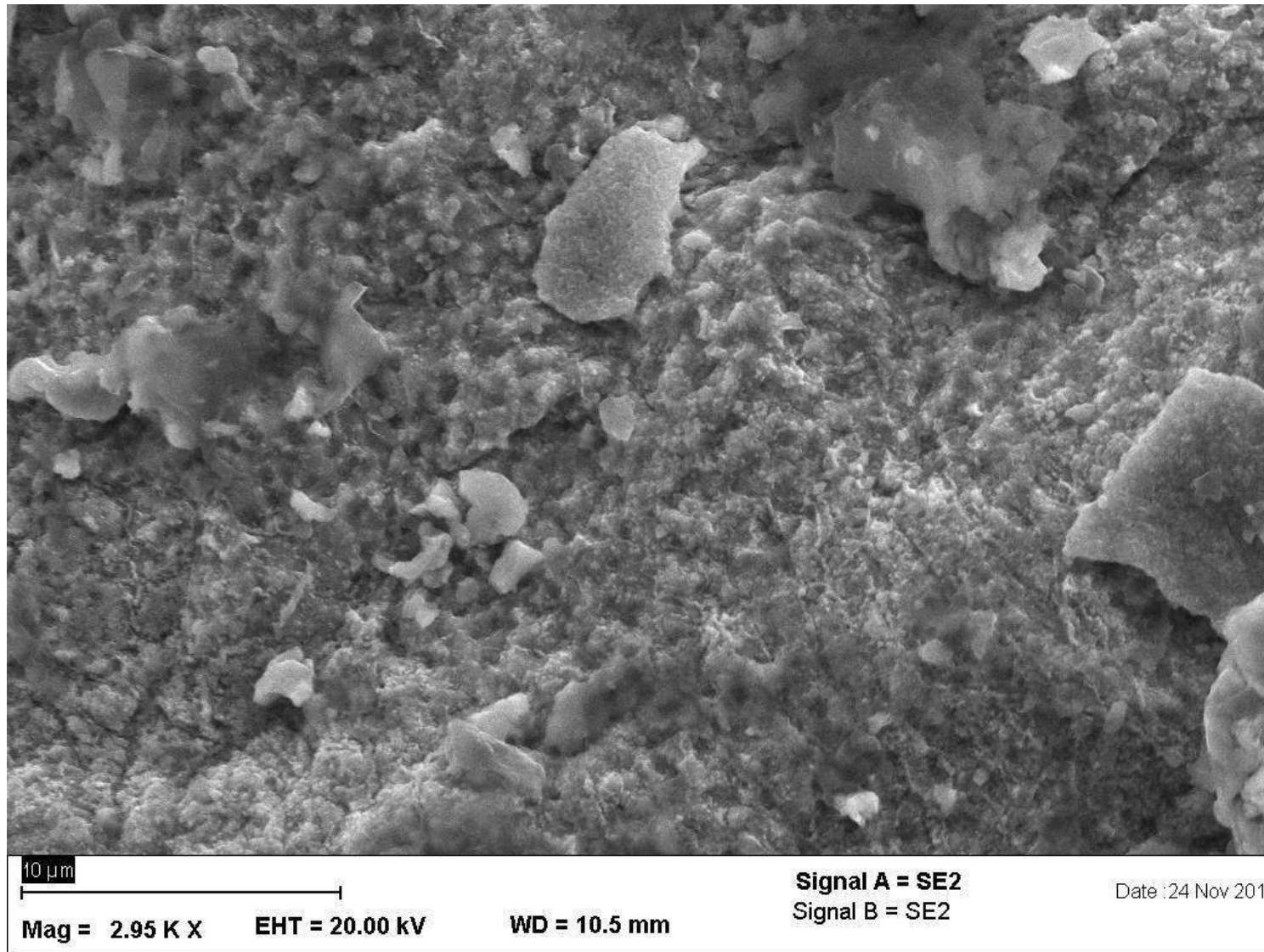








SEM image of Alloy 5a2 (Wu-tong) - Exp. 15, Note that no cuprite was formed (also not on the bi-metallic ‘shakudo’ alloy in the beginning of this document and a retry in 2017 on another sample of alloy 5a1). This supports the notion expressed by master goldsmiths Ford Hallam and David Loepp, that objects from Chinese Wu-tong copper alloys with a patina layer consisting of cuprite were likely patinated with a method similar to the Japanese patination method of submersion in aqueous patination fluids like ‘Niiro’. See for more information and a discussion on origins of the alloys: Ford Hallam, *Japanese Metalworking Technique* (Mommersteeg Vormgeving, forthcoming.)



SEM image of Alloy 5a2 (Wu-tong) - Exp. 15, Note that no cuprite was formed (also not on the bi-metallic ‘shakudo’ alloy in the beginning of this document and a retry in 2017 on another sample of alloy 5a1). This supports the notion expressed by master goldsmiths Ford Hallam and David Loepp, that objects from Chinese Wu-tong copper alloys with a patina layer consisting of cuprite were likely patinated with a method similar to the Japanese patination method of submersion in aqueous patination fluids like ‘Niiro’. See for more information and a discussion on origins of the alloys: Ford Hallam, *Japanese Metalworking Technique* (Mommersteeg Vormgeving, *forthcoming*.)