

APPENDIX 1

Caddisfly casings with artificial particles included, found in the wild and shared on the social media platform X, formerly known as Twitter: Álvarez Troncoso (2020), Kennedy (2018), Perks (2019) and South East Rivers Trust (2018).

References

- Álvarez Troncoso R, [Roaltron], 25 August 2020. Today I found a big piece of plastic into the case of a #Limnephilidae #caddisfly #trichoptera #microplastics [Tweet]. X. Retrieved October 1, 2023, from <https://twitter.com/Roaltron/status/1298211838467944448>
- Kennedy J, [socrates2sox], 3 June 2018. It's not only water quality, but rubbish too. I found this caddisfly larva in a Cumbrian pond, using plastic on his lovely casing [Tweet]. X. Retrieved October 1, 2023, from <https://twitter.com/socrates2sox/status/1003251584581718017>
- Perks J, [@JackPerksPhoto], 1 July 2019. I've been working with @GreenpeaceUK on Plastics in UK rivers. Heres a sad sight of a caddisfly with a piece of plastic in its shell. This then gets eaten by a fish and in turn a bird for example effecting the whole food chain [Tweet]. X. Retrieved October 1, 2023, from <https://twitter.com/JackPerksPhoto/status/1145605961622573057>
- South East Rivers Trust, [@SE_Rivers_Trust], 11 October 2018. A cased caddisfly using #microplastics to build its casing - a shocking image that clearly shows the poor state of our rivers and streams. #plasticpollution #plastics #riverfly. Photo credit to Dr Nick Overall and @SalmonTroutCons [Tweet]. X. Retrieved October 1, 2023, from https://twitter.com/SE_Rivers_Trust/status/1050342835587883009

APPENDIX 2 - Sample locations

2a. Coordinates of sampled ditches in the Betuwe (Gelderland, the Netherlands).

	Site coordinates	
Location	Latitude	Longitude
Betuwe 1	51.880197	5.203099
Betuwe 2	51.852654	5.282897
Betuwe 3	51.844705	5.295241
Betuwe 4	51.850448	5.602548
Betuwe 5	51.969126	5.439178
Betuwe 6	51.973067	5.449843
Betuwe 7	51.827413	5.429656

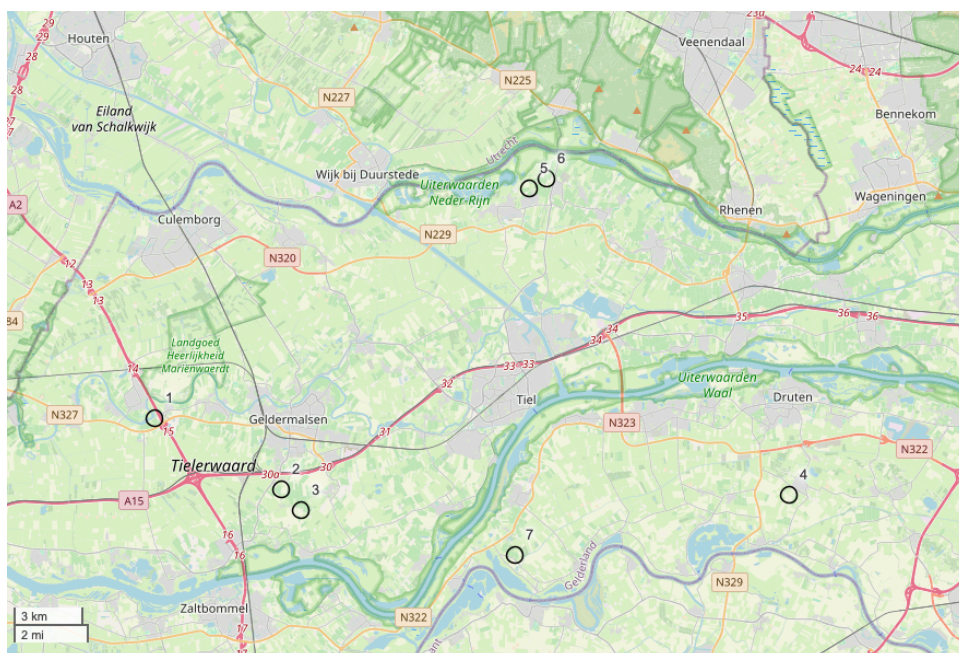


Fig. A1. Map made with OpenStreetMap of the Betuwe localities. Scale: 3 km.

2b. Coordinates of sample locations in the Noor (Limburg, the Netherlands).

	Site coordinates	
Location	Latitude	Longitude
Noorbeek 1	50.770579	5.807095
Noorbeek 2	50.770419	5.806664
Noorbeek 3	50.770439	5.806834
Noorbeek 4	50.769606	5.804588
Noorbeek 5.1	50.770063	5.80614
Noorbeek 5.2	50.770063	5.80614
Noorbeek 6	50.76896	5.804038
Noorbeek 7	50.766164	5.800077

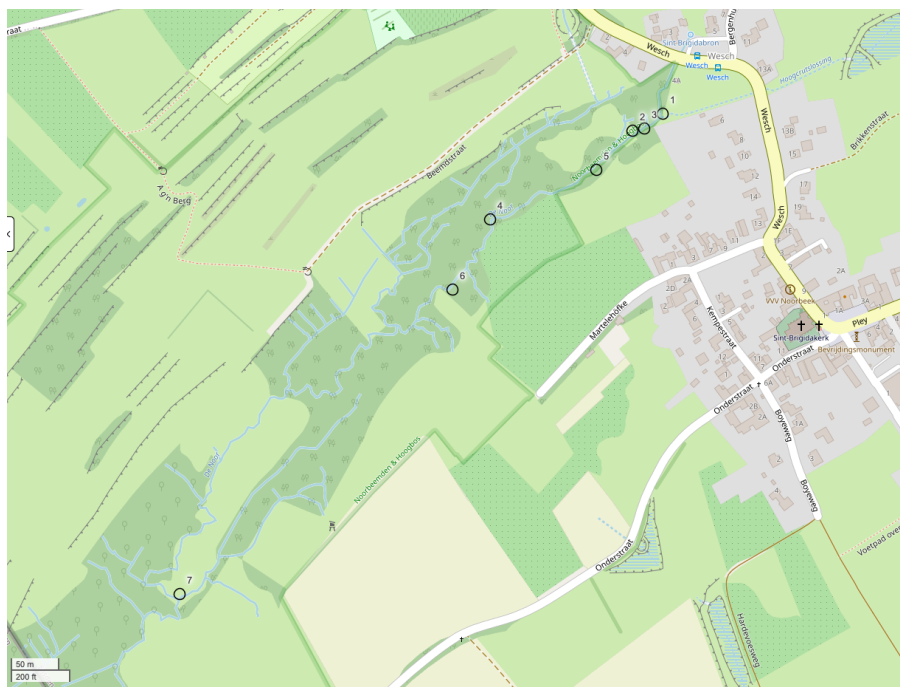


Fig. A2. Map made with OpenStreetMap of the Noorbeek localities. Scale: 50 m.

2c. Coordinates of sample locations in the Eyserbeek (Limburg, the Netherlands).

	Site coordinates	
Location	Latitude	Longitude
Simpelveld 1	50.833087	5.973047
Simpelveld 2	50.833818	5.977478
Simpelveld 3	50.82799	5.998138
Simpelveld 4	50.835387	5.990215
Simpelveld 5	50.831465	5.968276
Simpelveld 6	50.832569	5.969875
Simpelveld 7	50.833144	5.973616

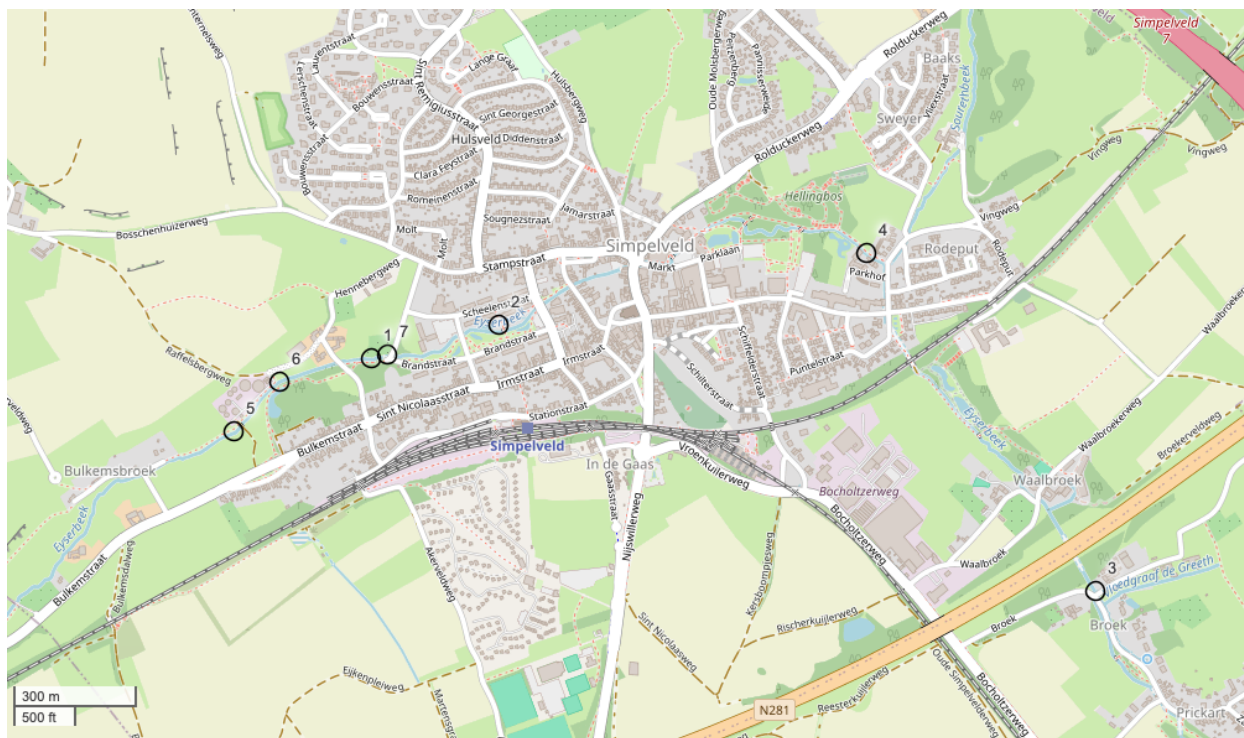


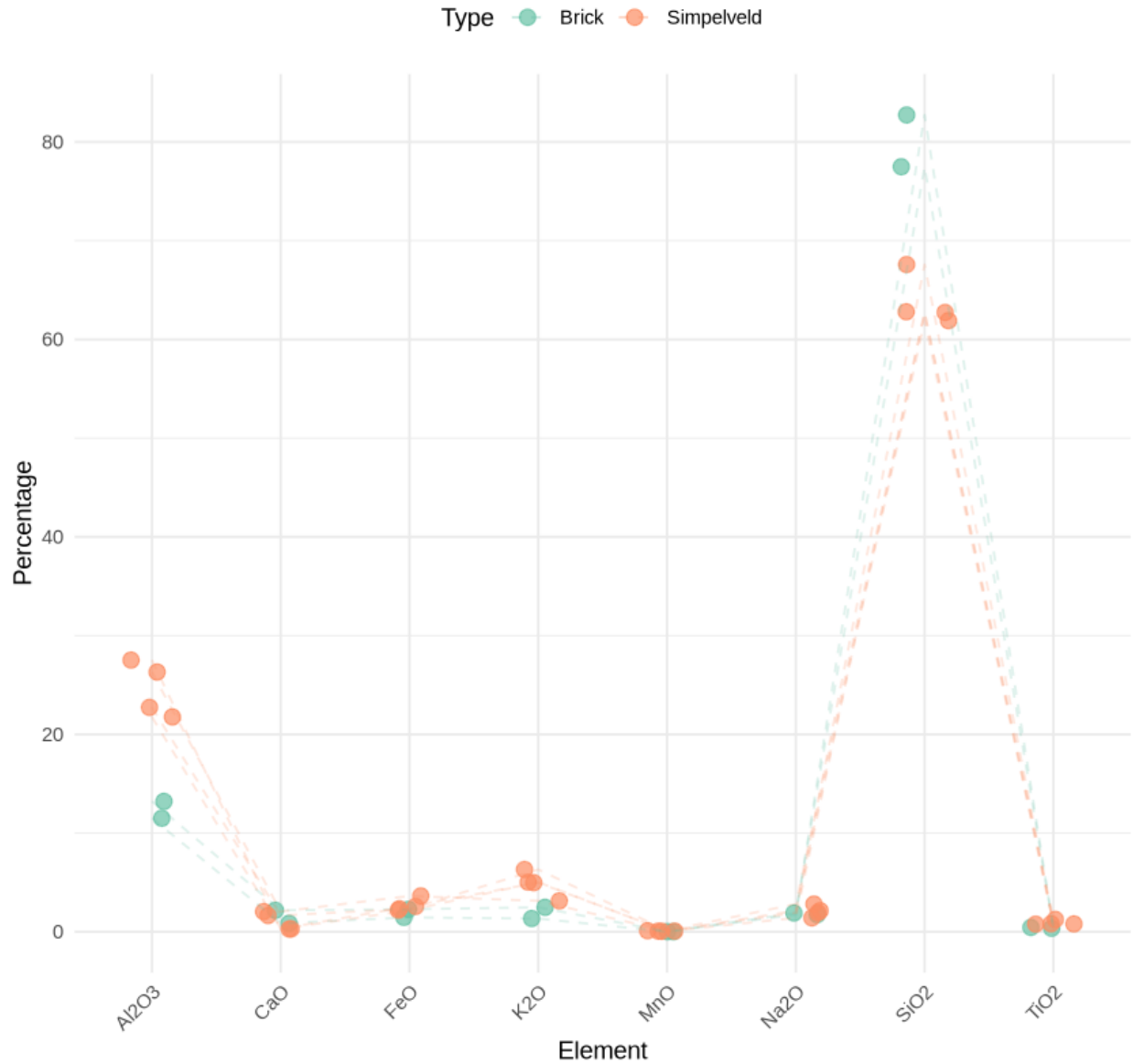
Fig. A3. Map made with OpenStreetMap of the Noorbeek localities. Scale: 300 m.

APPENDIX 3 - Scans ED-XRF analysis (ORBIS device)

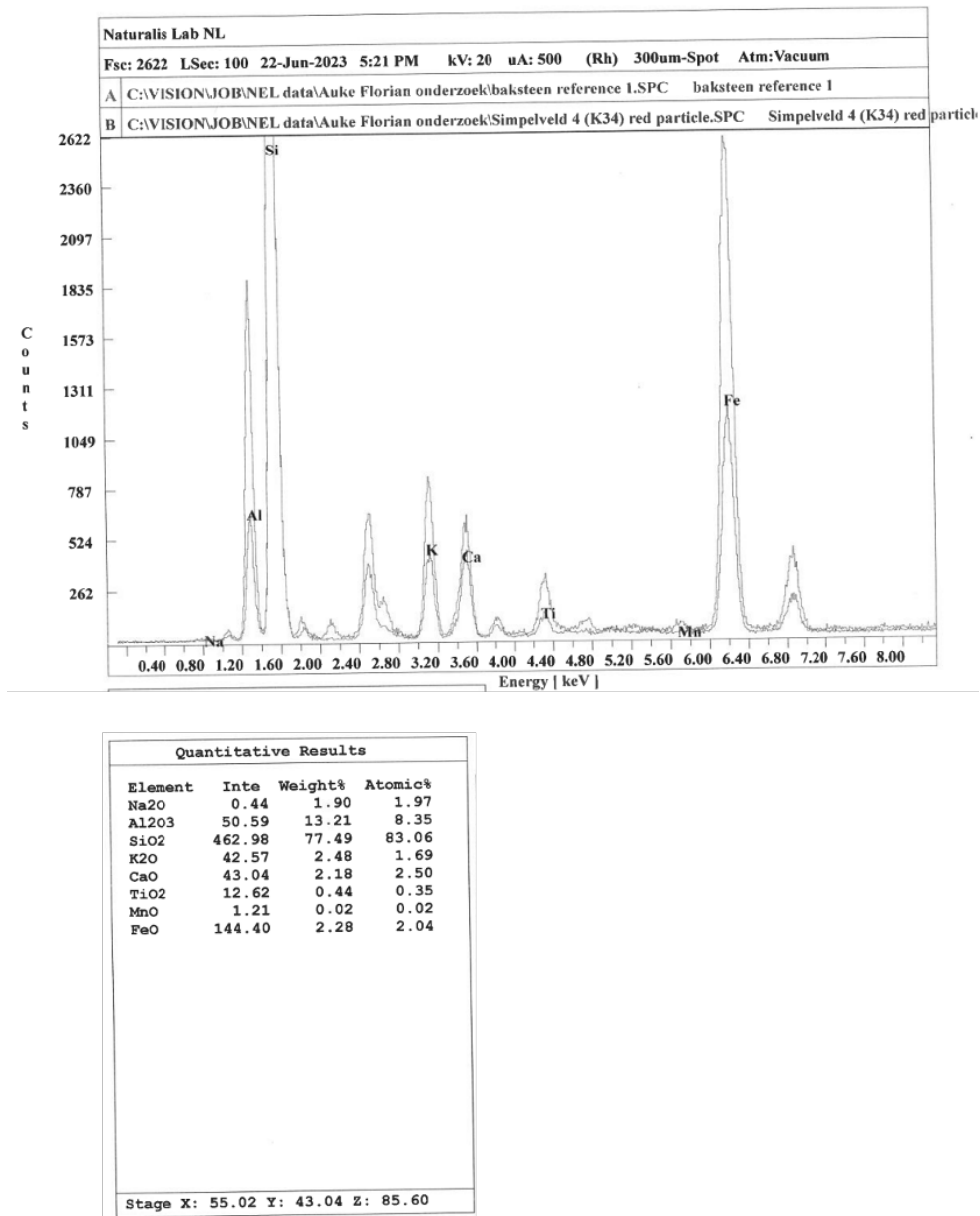
3a. The table presents the weight percentages of oxides (Na_2O , Al_2O_3 , SiO_2 , K_2O , CaO , TiO_2 , MnO , and FeO) determined by ED-XRF analysis, of two reference brick particles, and four presumed brick particles that were incorporated by caddisfly cases. Each value represents the mass percentage of the respective oxide in the sample.

	Weight (%)					
Element	Brick reference 1	Brick reference 2	Simpelveld 4 (K34) red particle 1	Simpelveld 4 (K34) red particle 2	Simpelveld 7 (N2) bright red particle	Simpelveld 7 (N2) orange red particle
Na_2O	1.9	1.74	2.14	1.41	2.81	1.93
Al_2O_3	13.21	11.5	26.31	27.52	22.73	21.76
SiO_2	77.49	82.73	61.9	62.73	62.8	67.58
K_2O	2.48	1.34	3.13	5.03	6.31	4.98
CaO	2.18	0.86	2.05	0.28	1.65	0.3
TiO_2	0.44	0.35	0.78	0.8	1.25	0.81
MnO	0.02	0.01	0.07	0.05	0.11	0.07
FeO	2.28	1.46	3.63	2.19	2.34	2.57

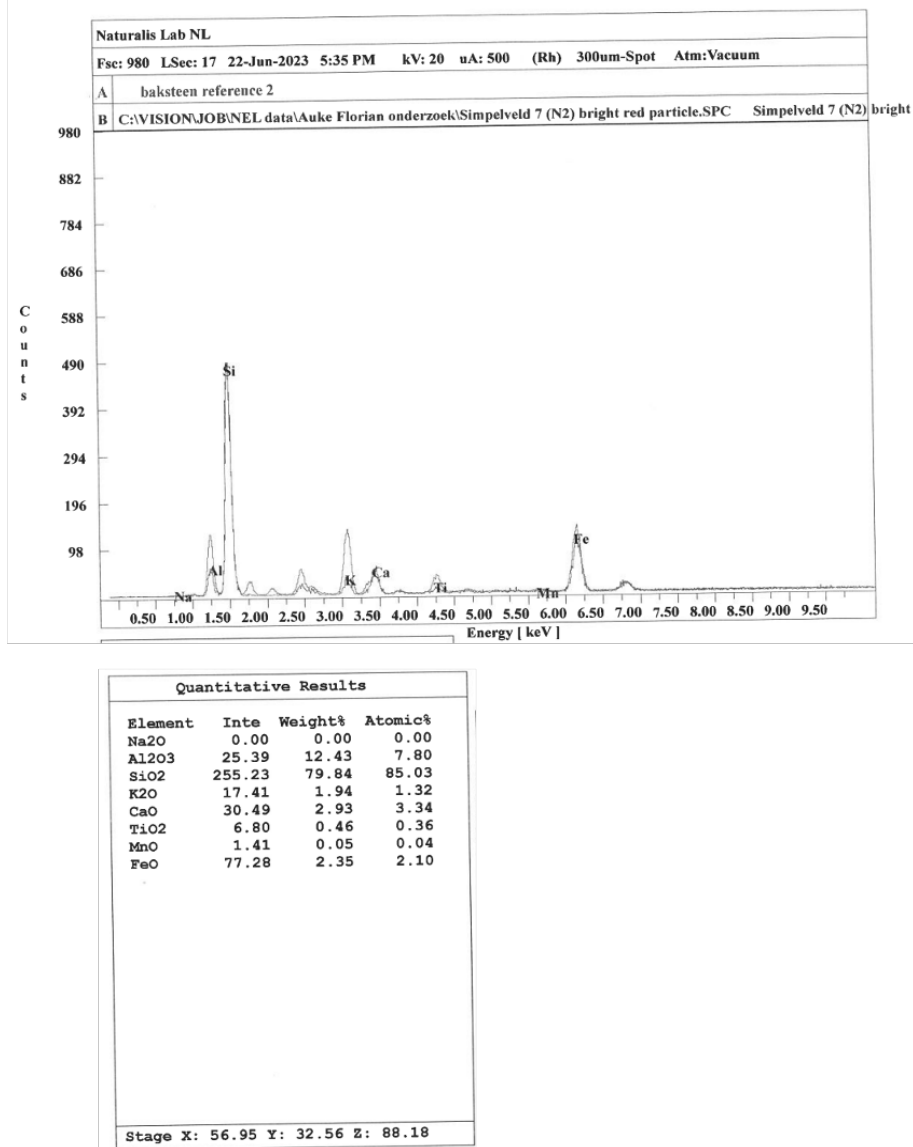
Individual Data Points for All Elements in Brick vs Sijpeveld Samples



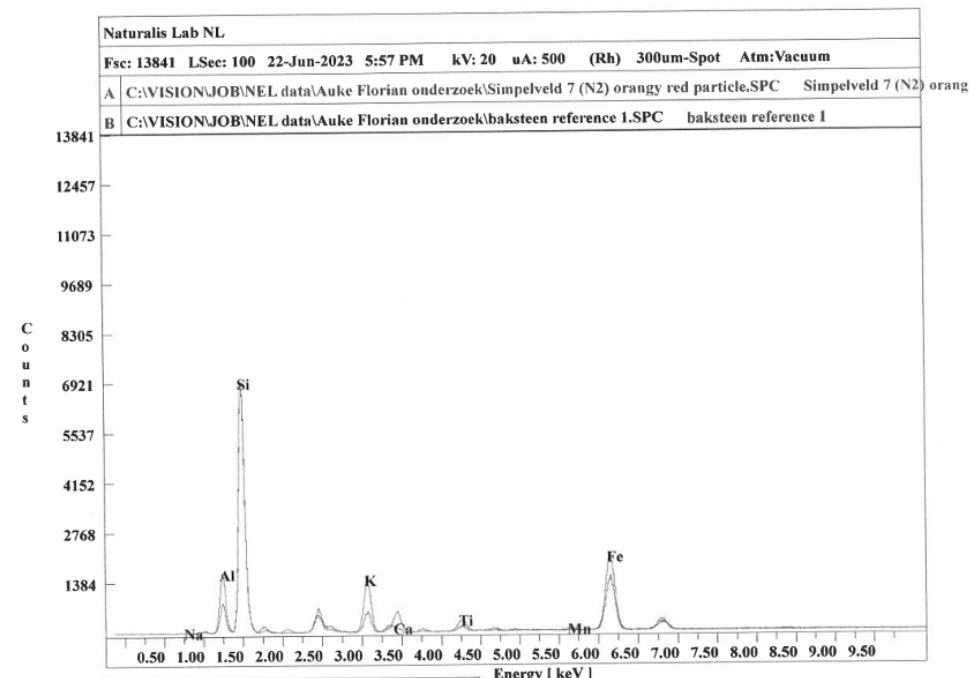
3b. Comparison weight percentages of oxides (Na₂O, Al₂O₃, SiO₂, K₂O, CaO, TiO₂, MnO, and FeO) determined by ED-XRF analysis, of two reference brick particles (green), and four presumed brick particles from Sijpeveld (orange) that were incorporated by caddisfly cases. Each value represents the mass percentage of the respective oxide in the sample.



3c. Graph of counts per element present in presumed brick particle in one of the cases of Simpelveld 4 (sample-ID K34) compared to the graph of brick reference material. Table showing quantitative results of present elements in the presumed brick particle (sample-ID K34, Simpelveld 4).



3d. Graph of counts per element present in presumed brick particle (bright red of colours) in a case from Simpelveld 7 (sample-ID N2) compared to the graph of brick reference material. Table showing quantitative results of present elements in the presumed brick particle (sample-ID N2, Simpelveld 7).



Element	Inte	Weight%	Atomic%
Na2O	0.71	1.96	2.15
Al2O3	132.04	22.17	14.78
SiO2	573.10	67.00	75.81
K2O	136.61	5.06	3.65
CaO	8.92	0.30	0.36
TiO2	36.77	0.82	0.70
MnO	6.52	0.08	0.07
FeO	254.23	2.61	2.47

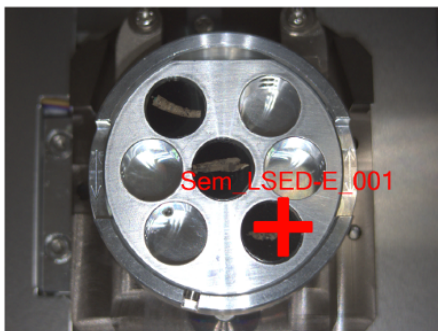
Stage X: 55.02 Y: 33.94 Z: 88.00

3e. Graph of counts per element present in presumed brick particle (orange of colours) in a case from Simpelveld 7 (sample-ID N2) compared to the graph of brick reference material. Table showing quantitative results of present elements in the presumed brick particle (sample-ID N2, Simpelveld 7).

APPENDIX 4 - EDX results

4a. Point measuring: *Chaetopteryx villosa* casing (**Fig. 4A**) with a blue particle incorporated (Sample-ID F15, Noorbeek 5.1).

EDS 20240603

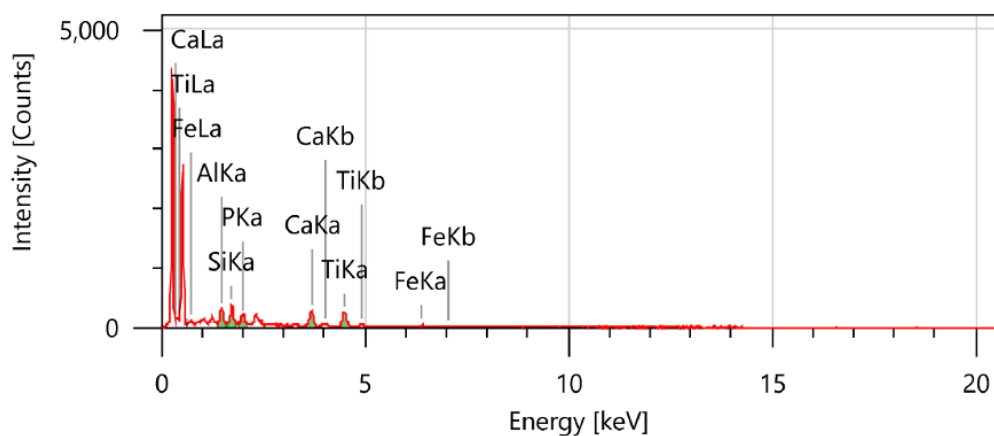


20 mm

Sem_LSED-E_001

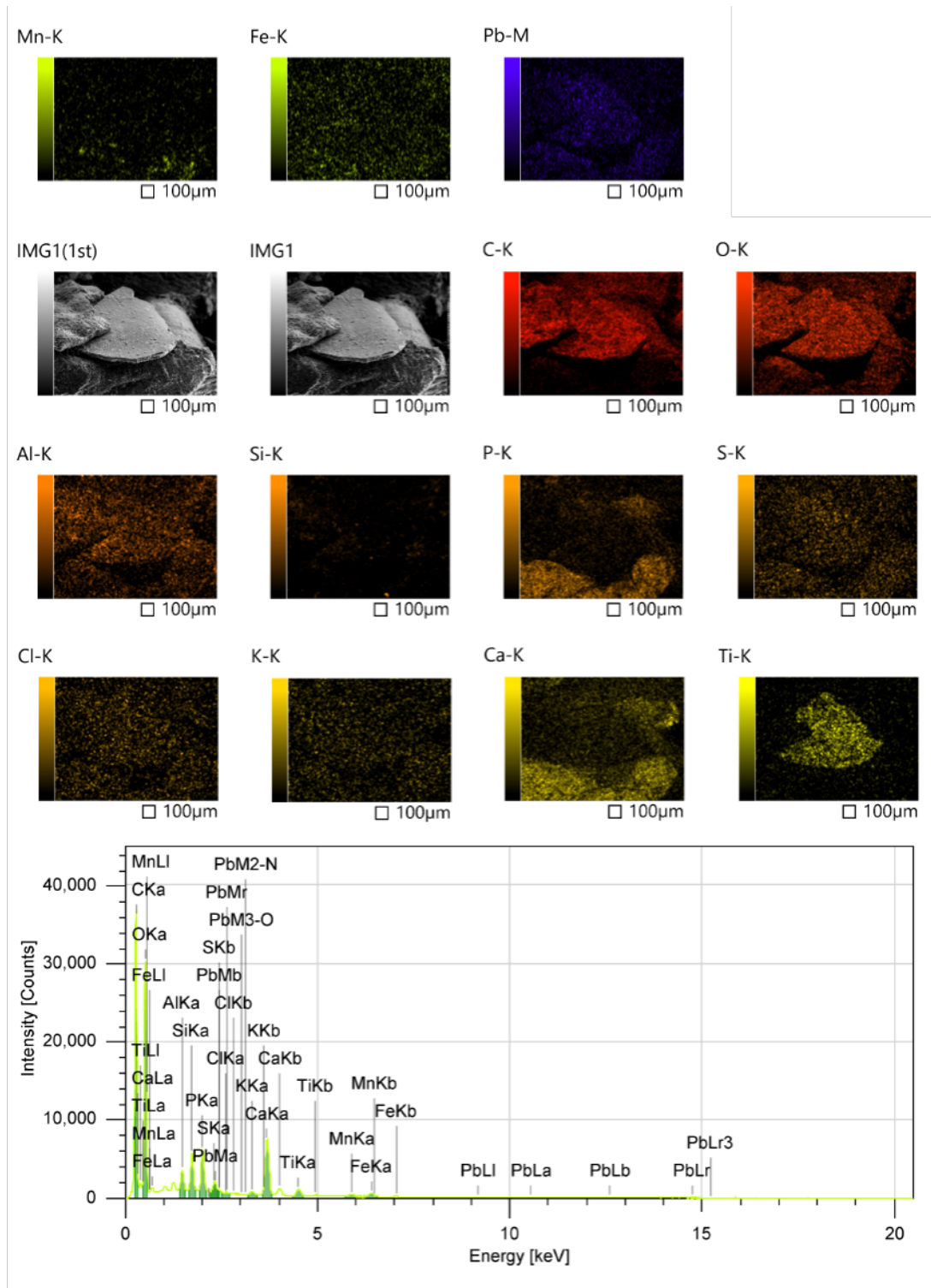


100 µm



Element	Line	Mass%	Atom%
Al	K	9.56±0.39	13.57±0.56
Si	K	12.19±0.45	16.62±0.62
P	K	9.96±0.42	12.32±0.52
Ca	K	23.68±0.75	22.63±0.72
Ti	K	37.37±1.13	29.89±0.91
Fe	K	7.24±0.74	4.97±0.51
Total		100.00	100.00
Spc_004		Fitting ratio 0.8779	

4b. Mapping measuring: *Chaetopteryx villosa* casing (**Fig. 4A**) with a blue particle incorporated (Sample-ID F15, Noorbeek 5.1).

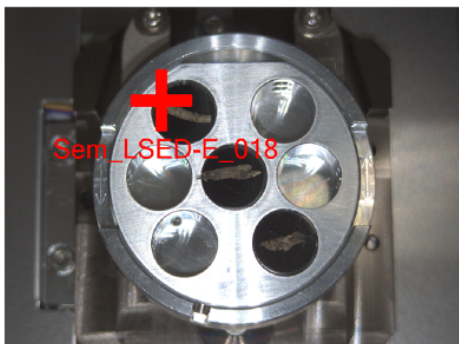


APPENDIX 5 - EDX results

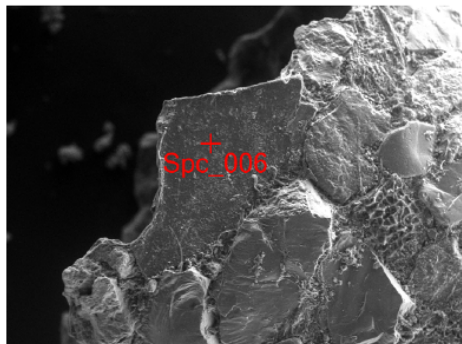
5a. Point measuring: Casing with green and flat particle (Sample-ID G1, Noorbeek 2).

EDS 20240603

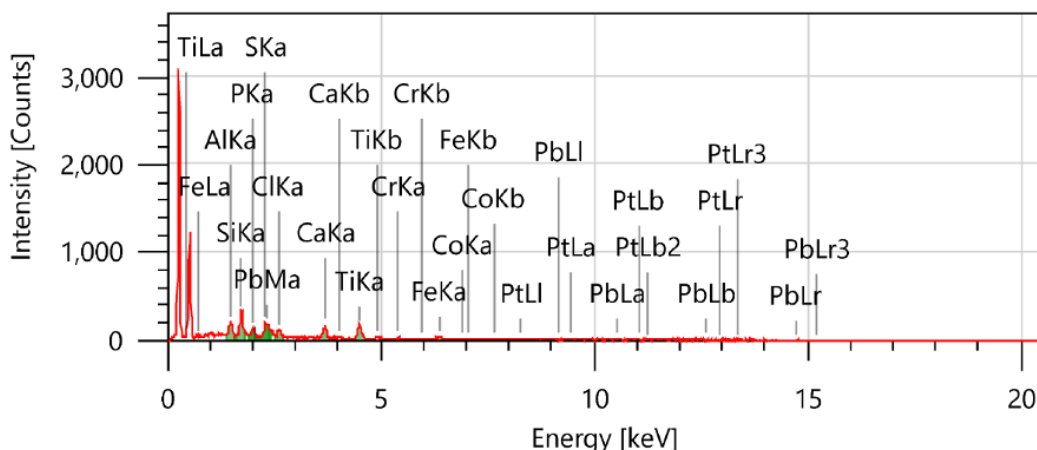
Sem_LSED-E_018



20 mm



200 µm



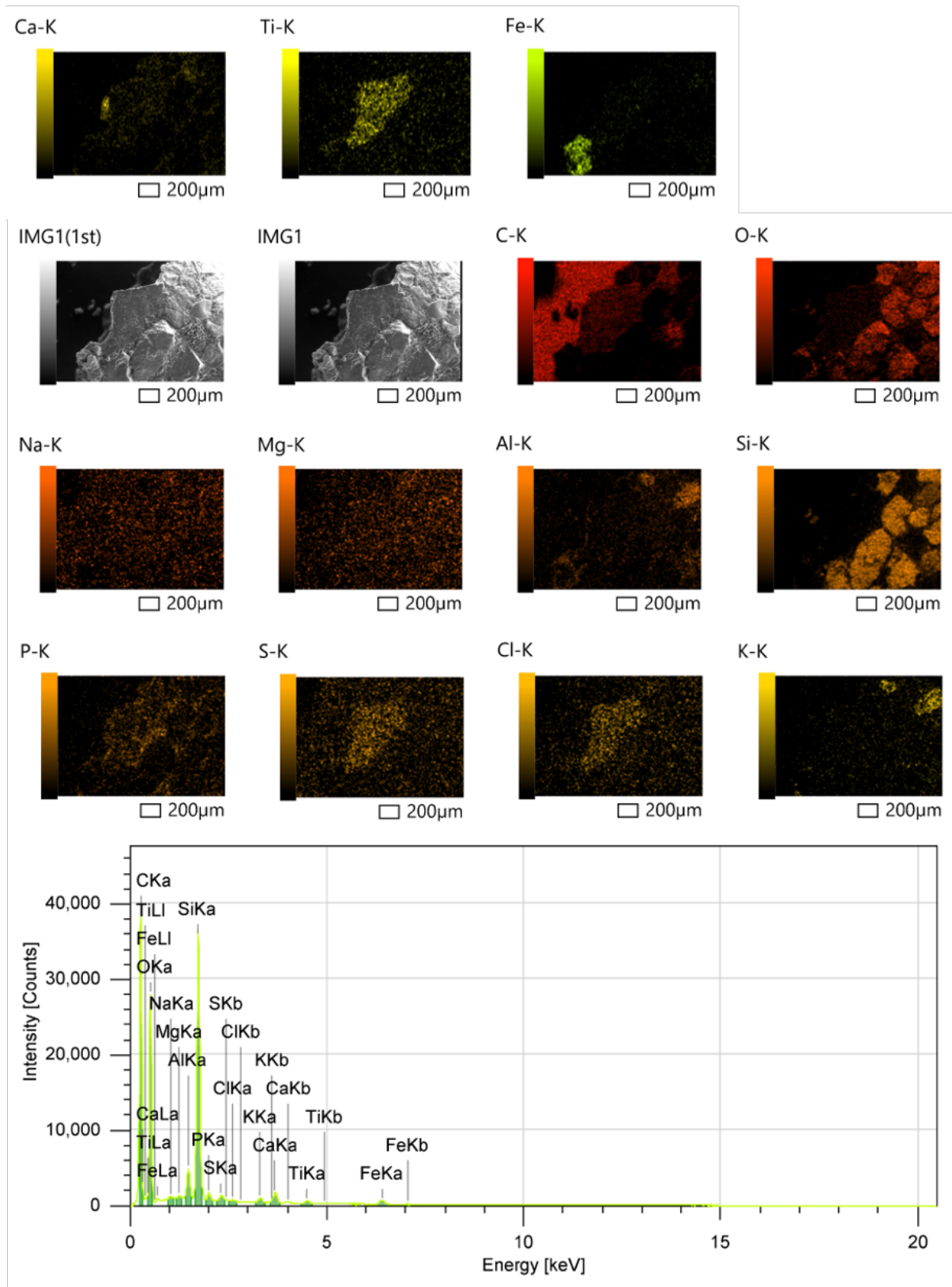
Display name	Standard data	Quantification method	Result Type
Spc_006	Standardless	ZAF	Metal

Element	Line	Mass%	Atom%
Al	K	5.22±0.31	8.86±0.52
Si	K	11.82±0.44	19.29±0.72
P	K	4.65±0.30	6.88±0.44
S	K	4.11±0.29	5.87±0.42
Cl	K	5.61±0.34	7.24±0.44
Ca	K	12.67±0.59	14.48±0.67
Ti	K	21.65±0.88	20.71±0.84
Cr	K	3.14±0.44	2.76±0.39
Fe	K	10.54±0.86	8.65±0.71
Co	K	1.23±0.44	0.95±0.34
Pt	M	0.72±0.65	0.17±0.15
Pb	M	18.66±1.16	4.13±0.26
Total		100.00	100.00

Spc_006

Fitting ratio 0.8515

5b. Mapping measuring: Casing with green and flat particle (Sample-ID G1, Noorbeek 2).



APPENDIX 6 - EDX results

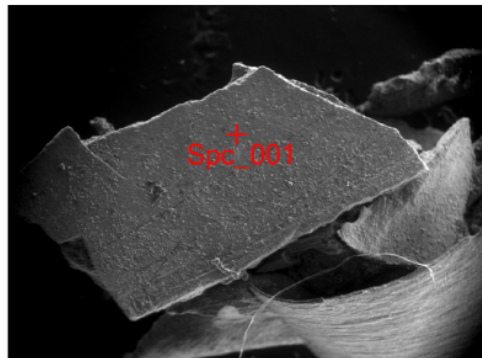
6a. Point measuring: Casing with a white, flat, speckled and layered particle, (Sample-ID F13, Noorbeek 5.1).

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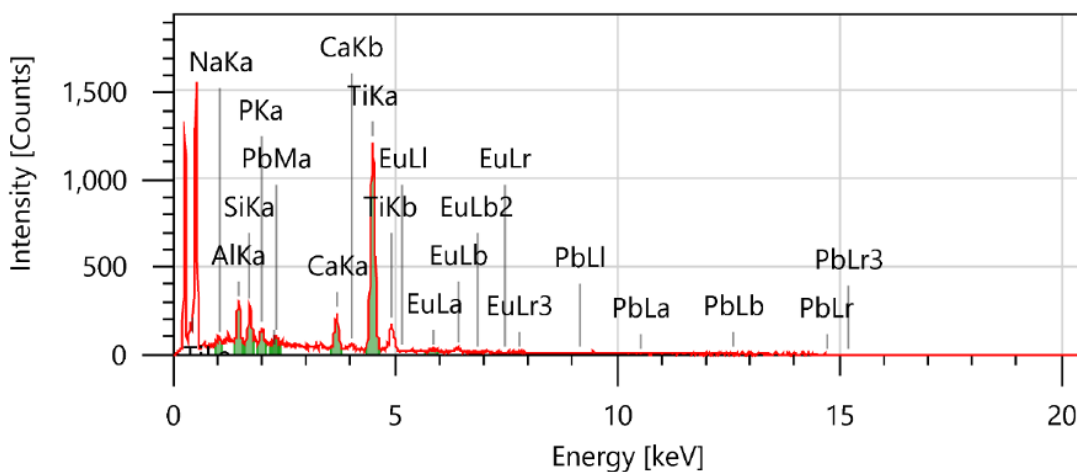


20 mm

Sem_LSED-E_001

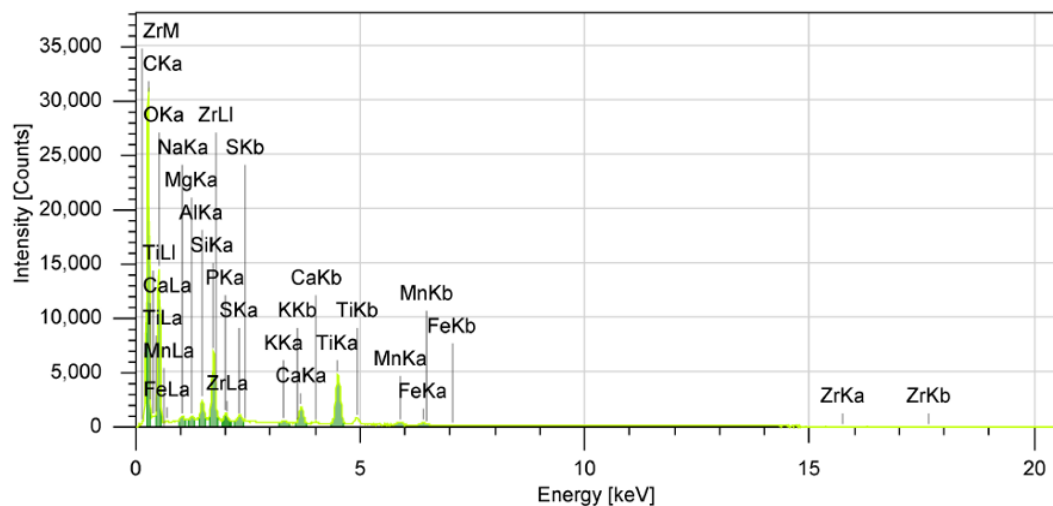
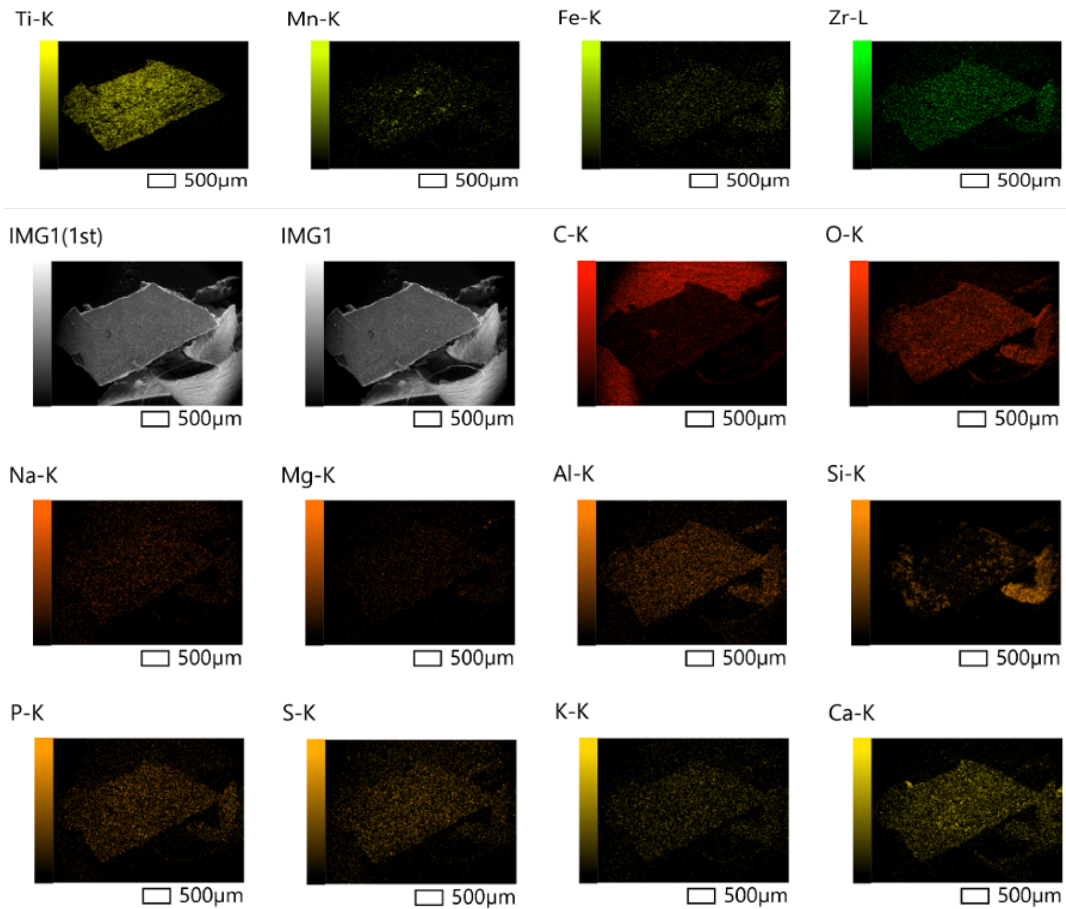


500 µm



Element	Line	Mass%	Atom%
Na	K	1.17±0.12	2.31±0.24
Al	K	4.18±0.18	7.03±0.30
Si	K	3.48±0.17	5.62±0.27
P	K	1.96±0.13	2.87±0.19
S	K	0.85±0.09	1.21±0.13
Ca	K	7.31±0.27	8.28±0.30
Ti	K	75.01±1.01	71.06±0.96
Eu	L	3.77±0.56	1.12±0.17
Pb	M	2.26±0.33	0.49±0.07
Total		100.00	100.00
Spc_001		Fitting ratio 0.4796	

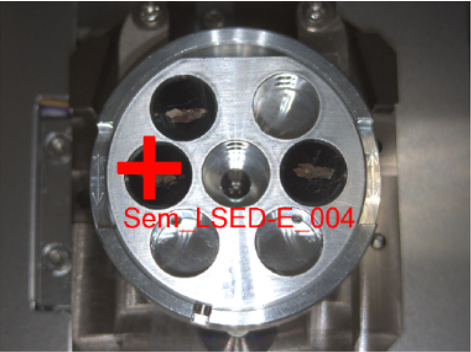
6b. Mapping measuring: Casing with a white, flat, speckled and layered particle, (Sample-ID F13, Noorbek 5.1).



Appendix 7 - EDX results

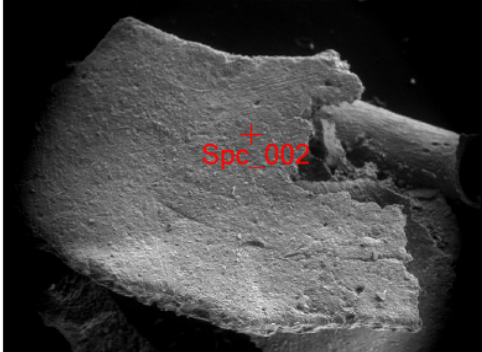
7a. Point measuring: Casing with a flat, speckled and bristle particle (Sample-ID G2, Noorbeek 2).

EDS 20240603-2

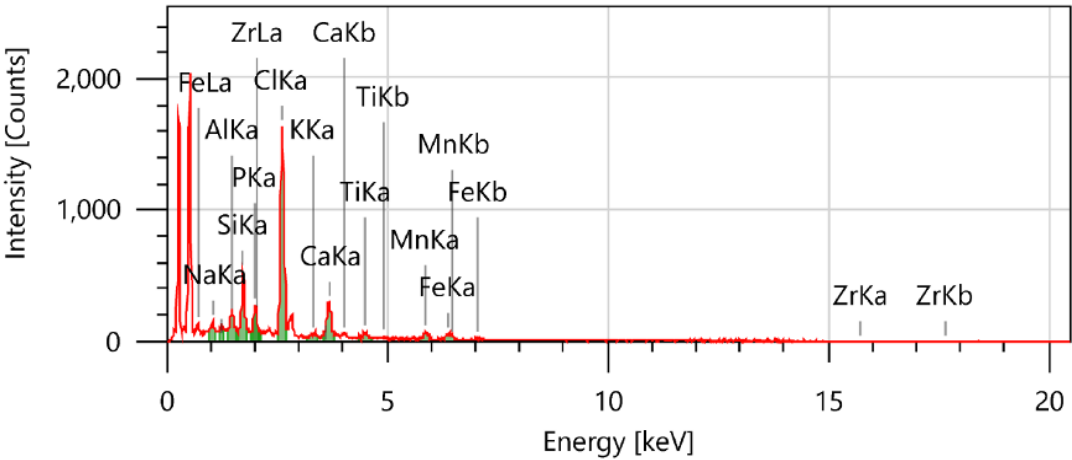


20 mm

Sem_LSED-E_004

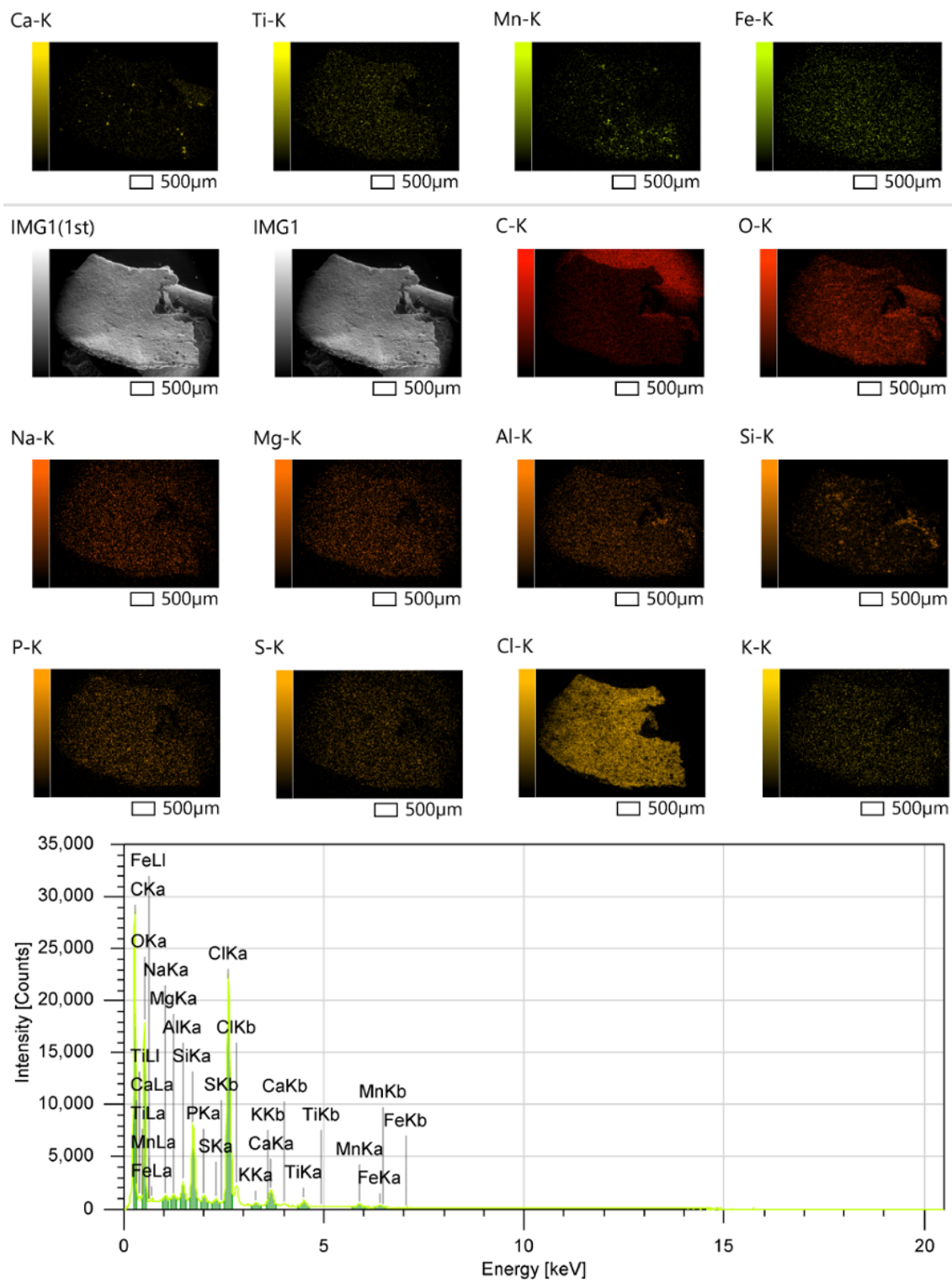


500 µm



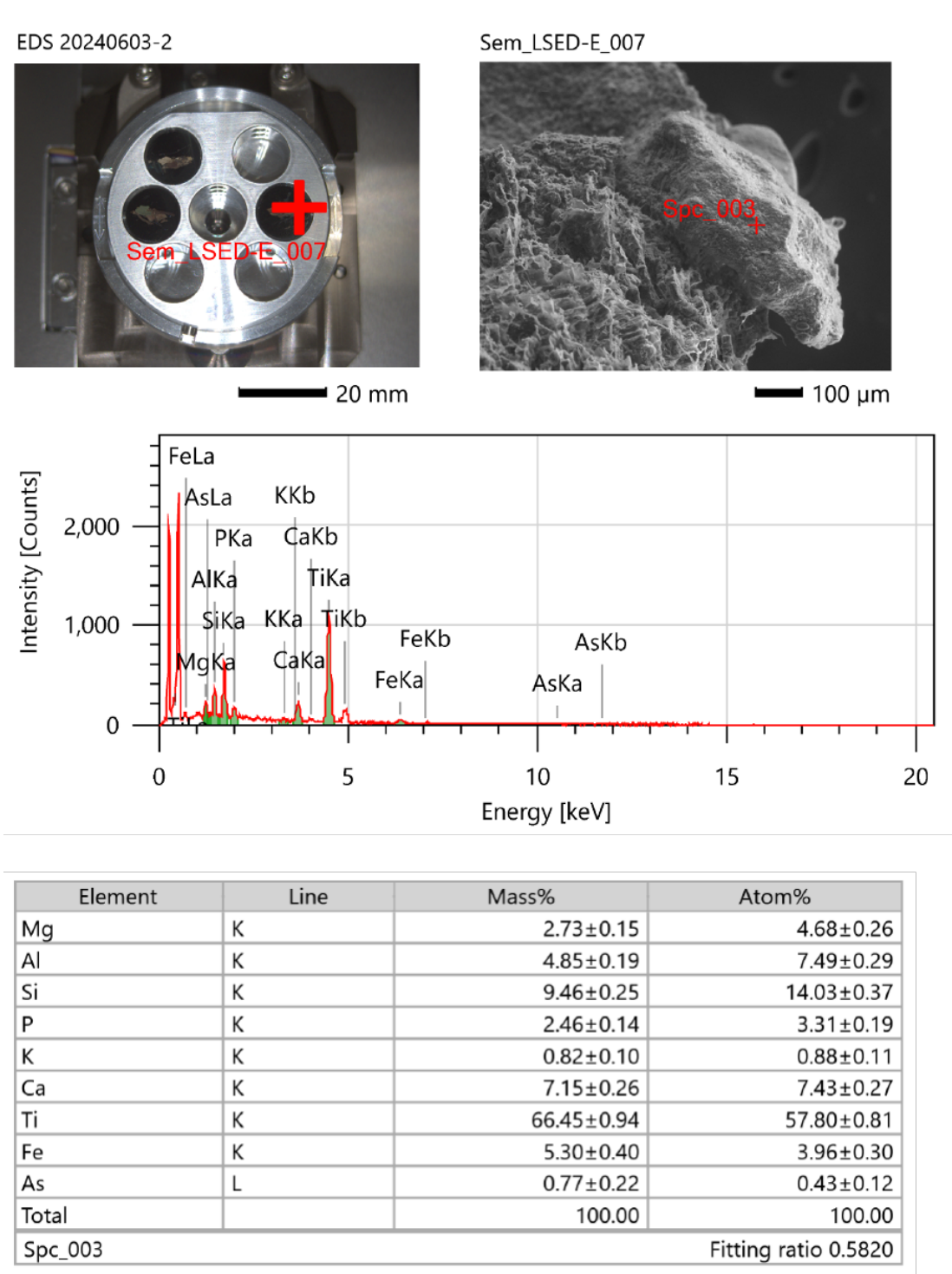
Element	Line	Mass%	Atom%
Na	K	1.39±0.13	2.25±0.21
Mg	K	0.80±0.10	1.22±0.15
Al	K	2.35±0.14	3.25±0.20
Si	K	8.28±0.24	10.98±0.32
P	K	5.05±0.20	6.07±0.25
Cl	K	46.67±0.59	49.01±0.62
K	K	1.22±0.15	1.16±0.14
Ca	K	12.54±0.41	11.65±0.38
Ti	K	3.74±0.27	2.91±0.21
Mn	K	7.84±0.49	5.31±0.33
Fe	K	7.97±0.53	5.31±0.35
Zr	L	2.15±0.35	0.88±0.14
Total		100.00	100.00
Spc_002		Fitting ratio 0.5631	

7b. Mapping measuring: Casing with a flat, speckled and bristle particle (Sample-ID G2, Noorbeek 2).



APPENDIX 8 - EDX results

8a. Point measuring: Casings with a piece of white foam (Sample-ID F11, Noorbeek 5.1).



8b. Mapping measuring: Casings with a piece of white foam (Sample-ID F11, Noorbeek 5.1).

