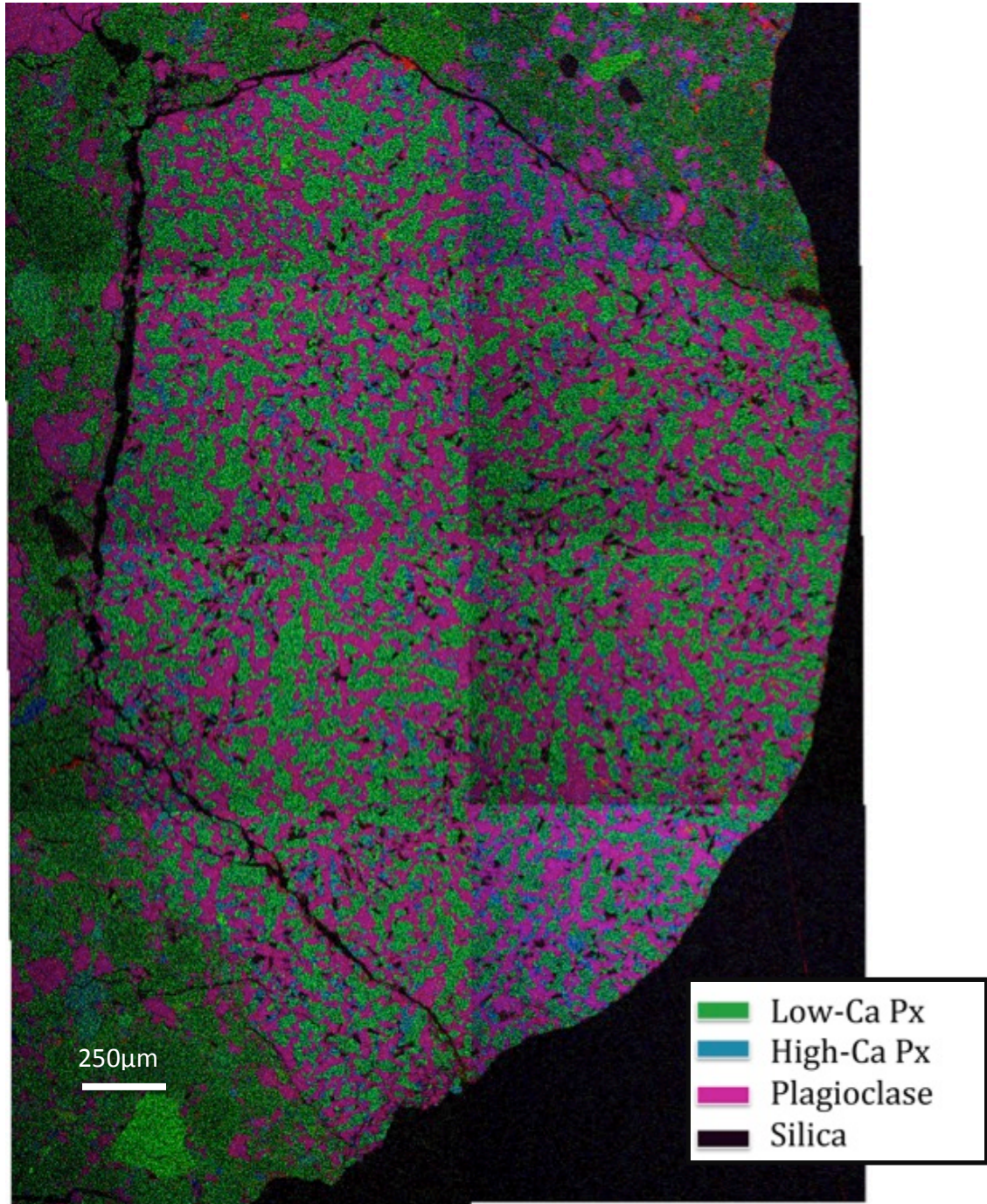


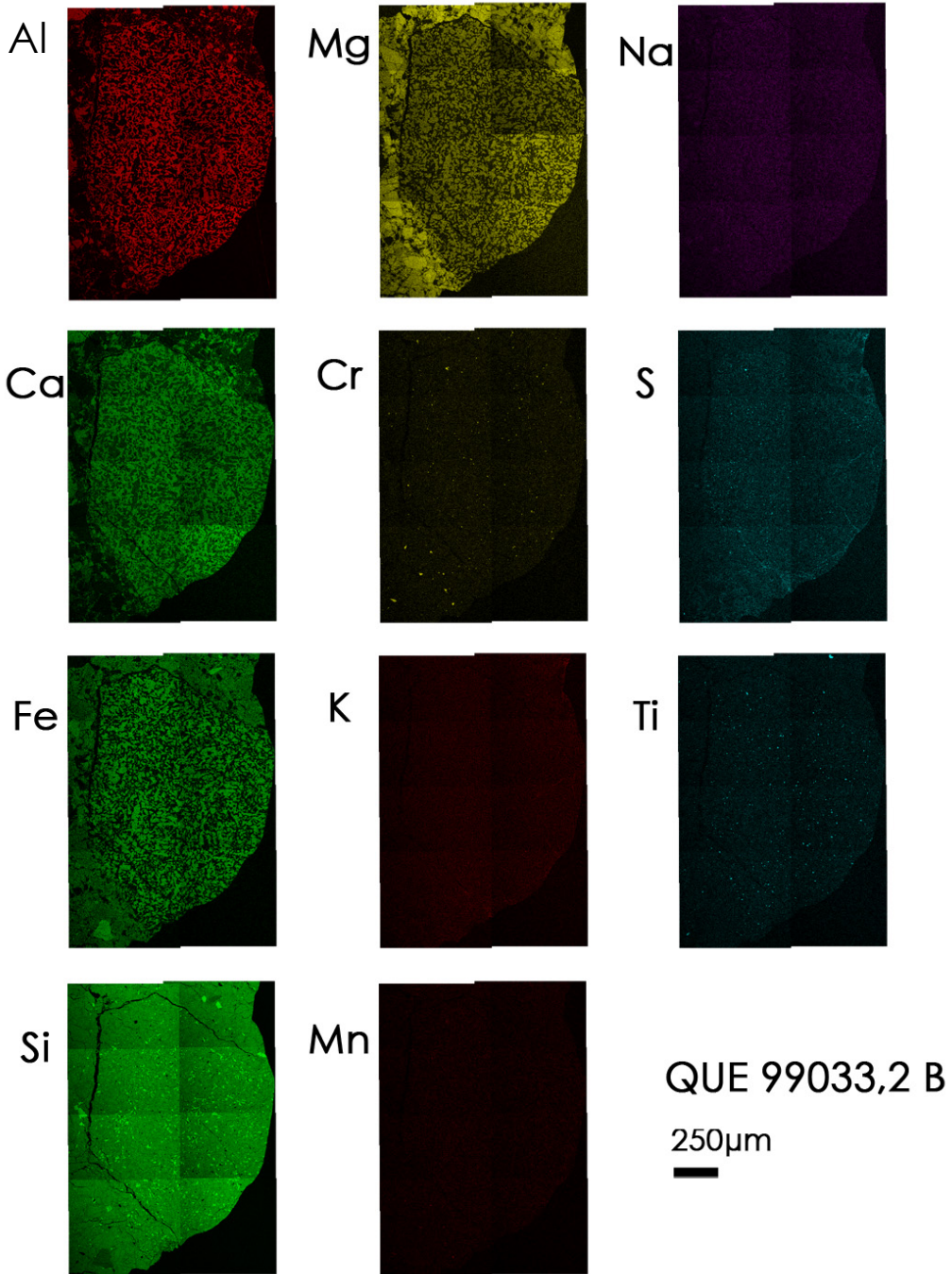
Appendix D – QUE 99033,2B

D1. SEM Mineral Map

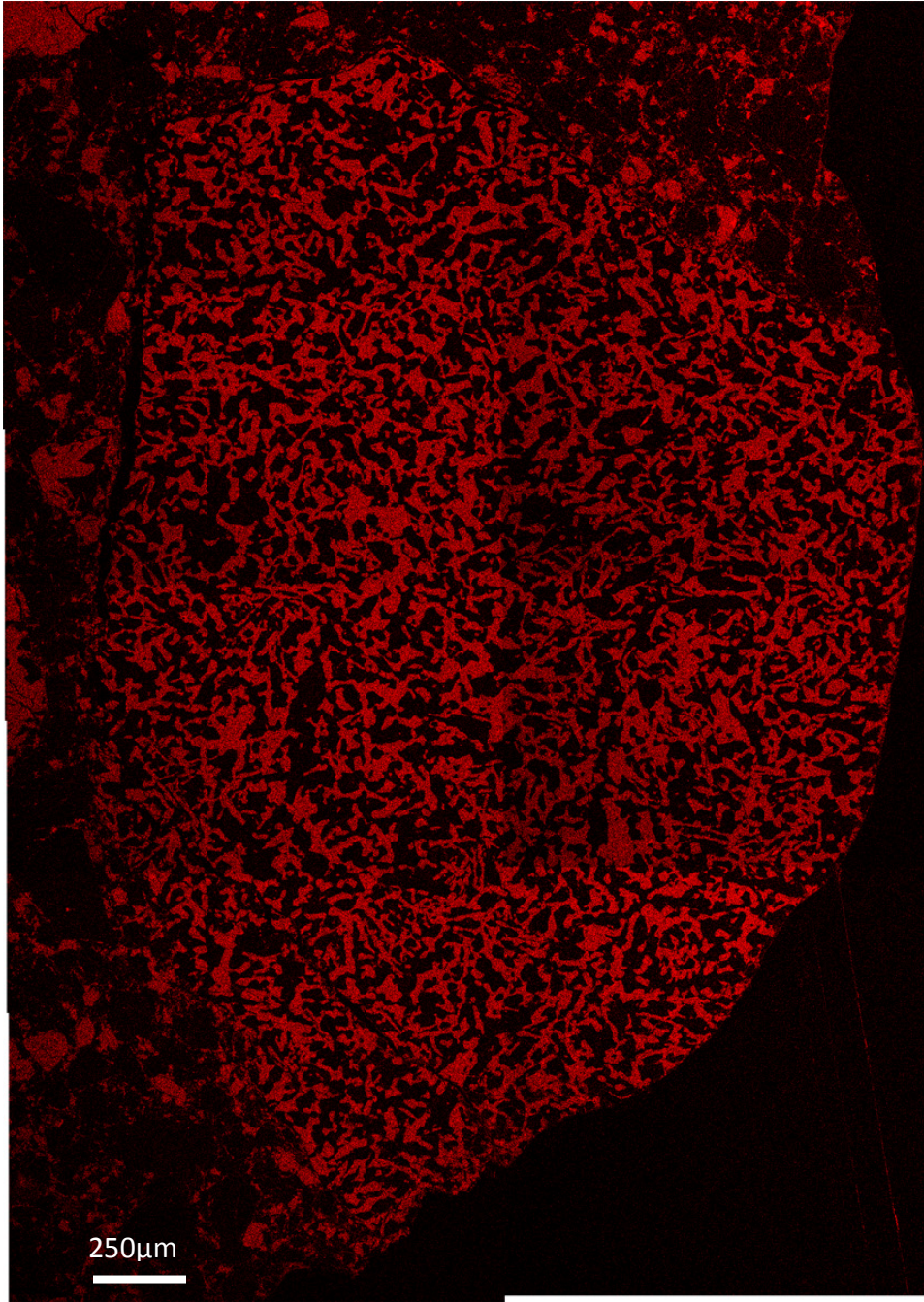


QUE 99033,2B has sub-millimeter scale, equigranular plagioclase and pyroxene. Silica is observed within the clast. The black area on right hand side of the map is the edge of the sample.

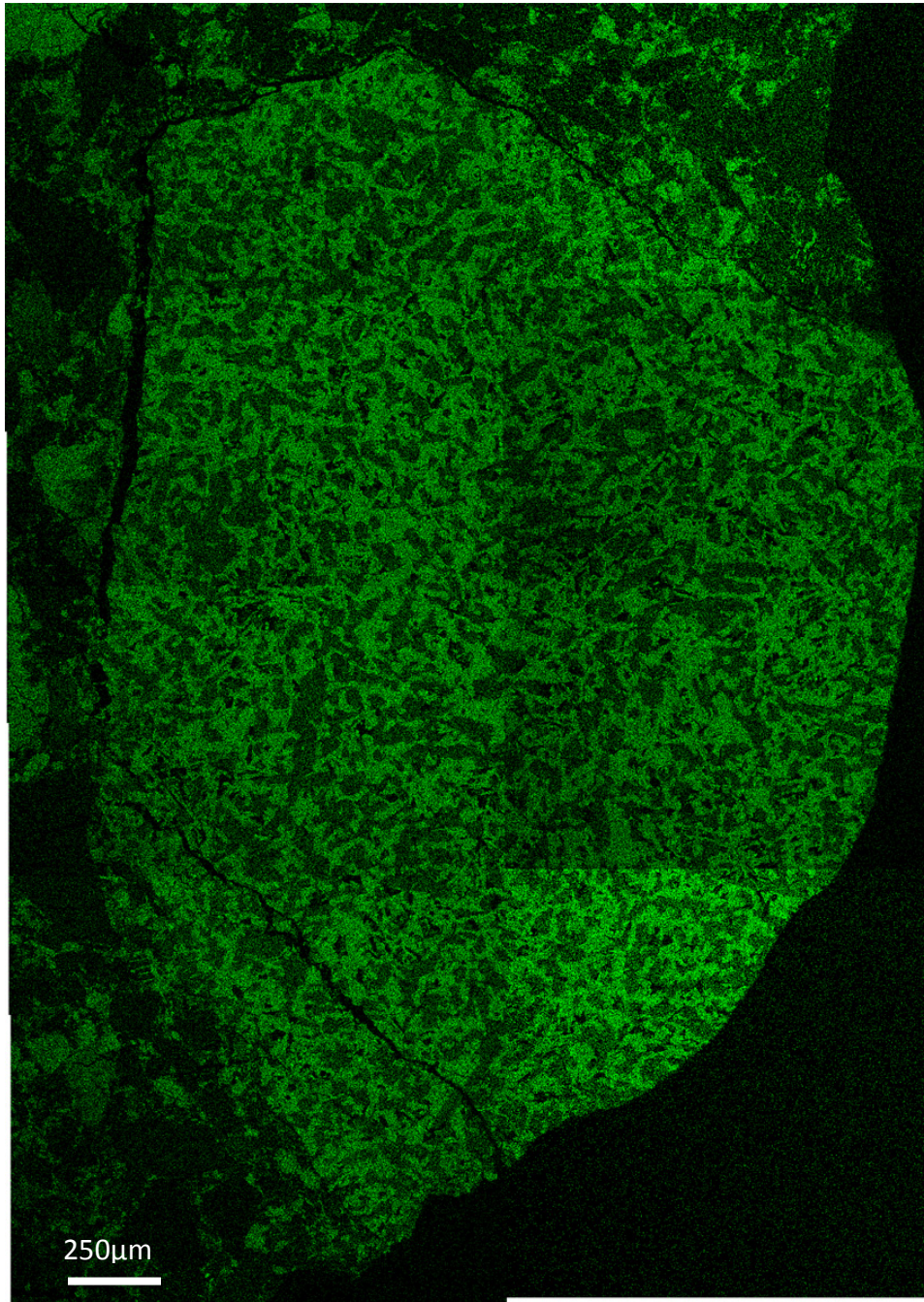
D2. SEM Elemental X-ray maps (All clasts were analyzed for eleven elements (Al, Ca, Fe, Si, Mg, Cr, K, Mn, Na, S, and Ti); however if some are extremely dark, this is due to the fact that the element appeared below the detection limit of the SEM, thus showing a colored map with no distinguishable data. For this reason, we have not included a full size element map of K, Na, and Mn.



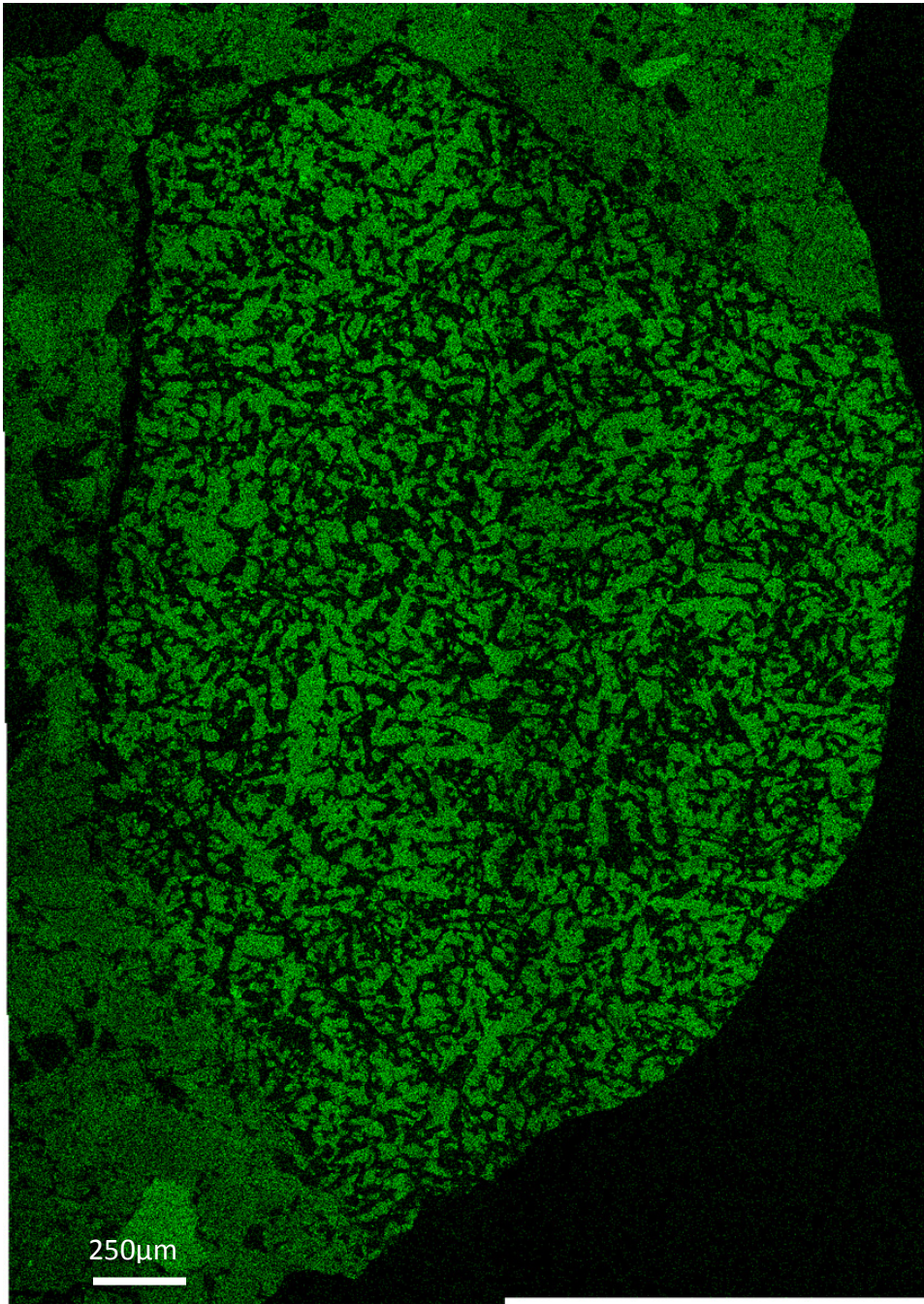
Al



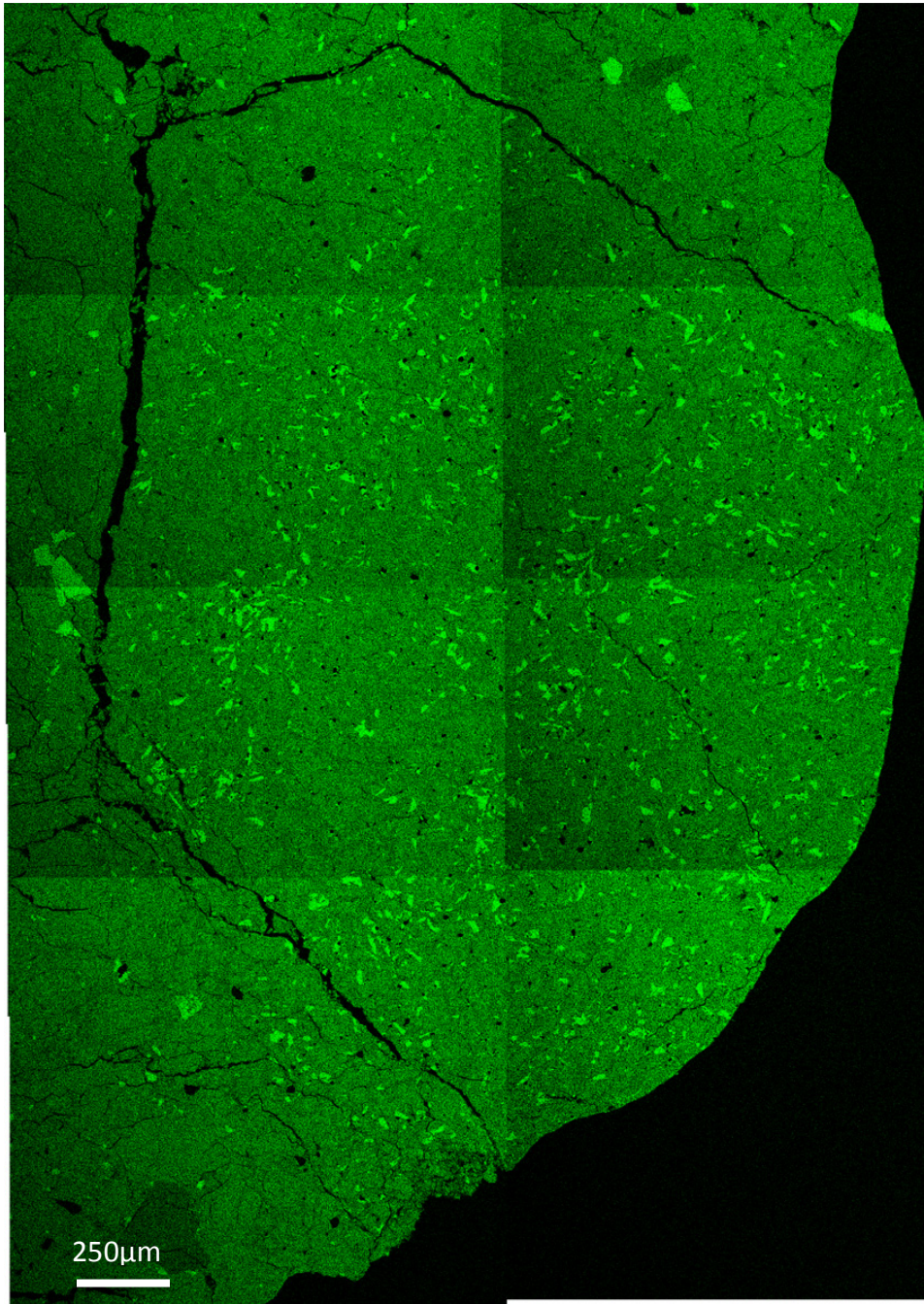
Ca



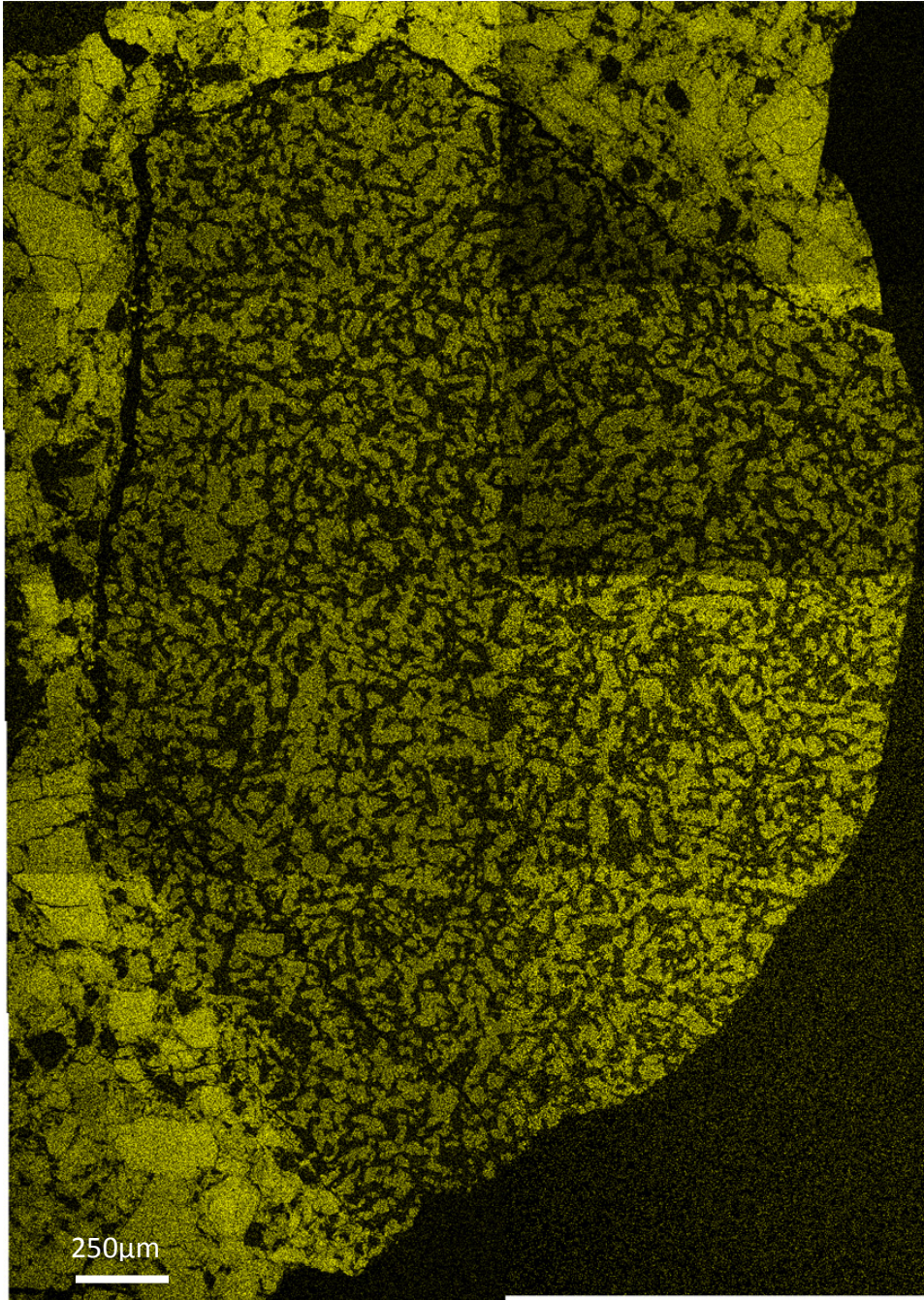
Fe



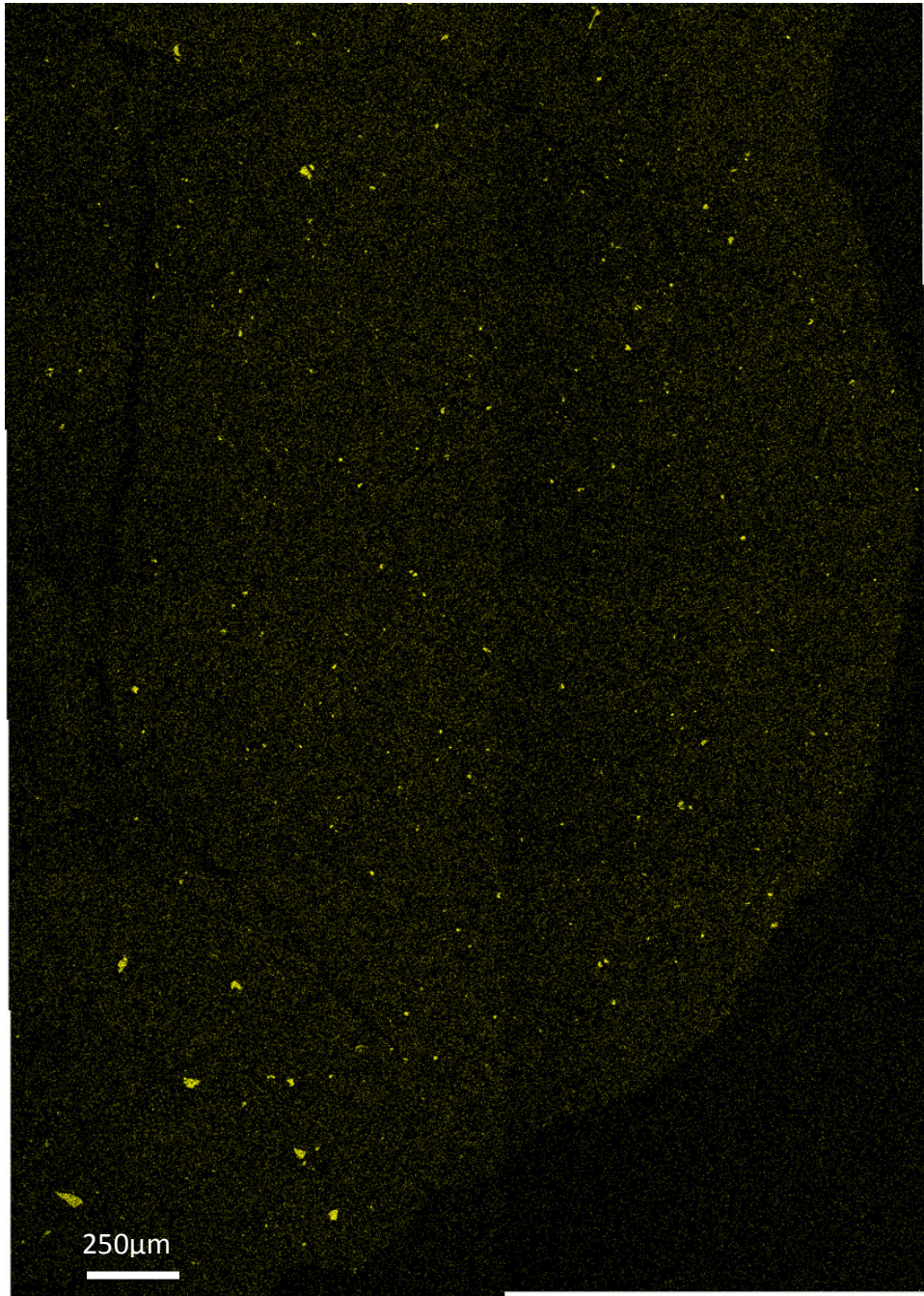
Si



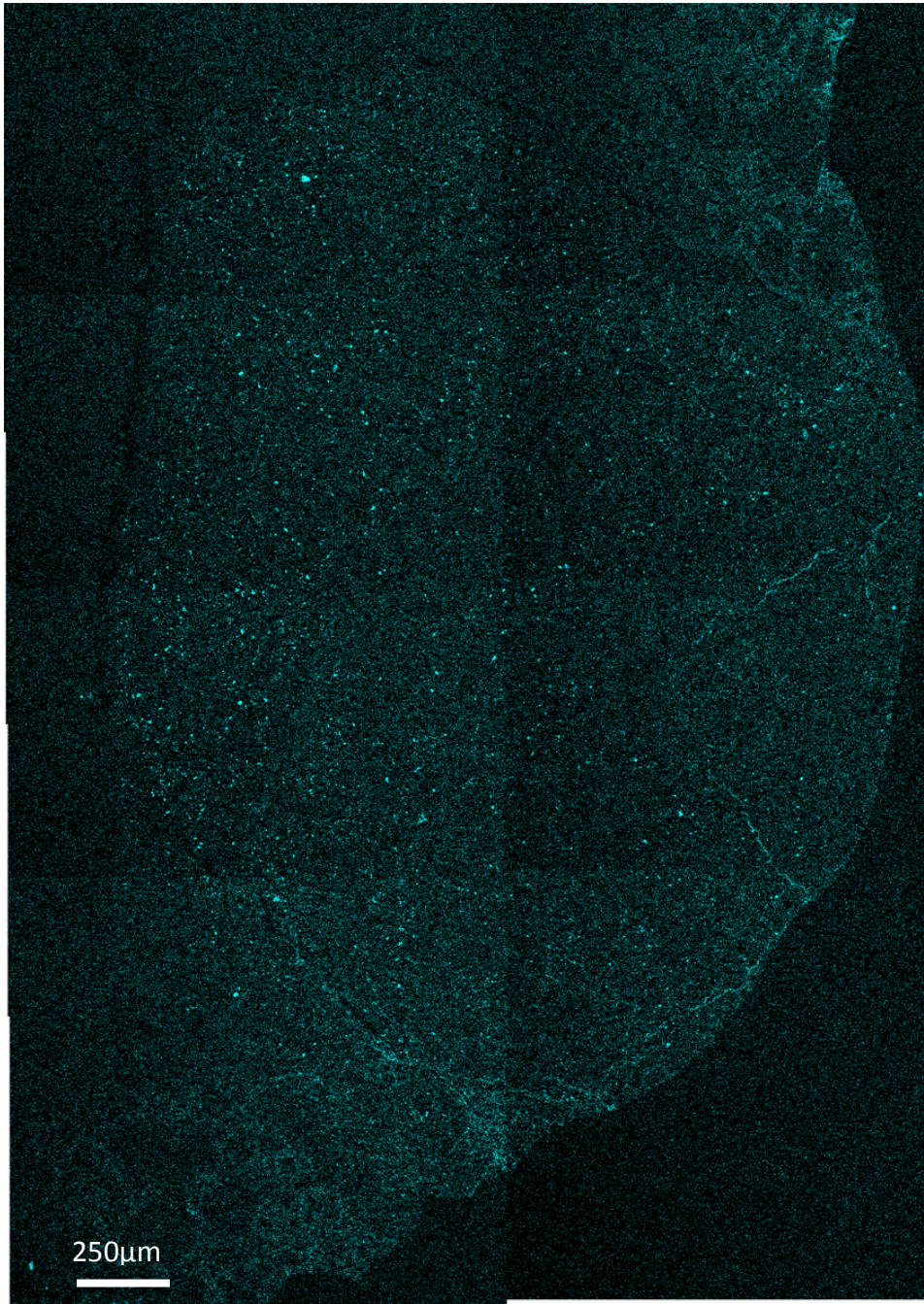
Mg



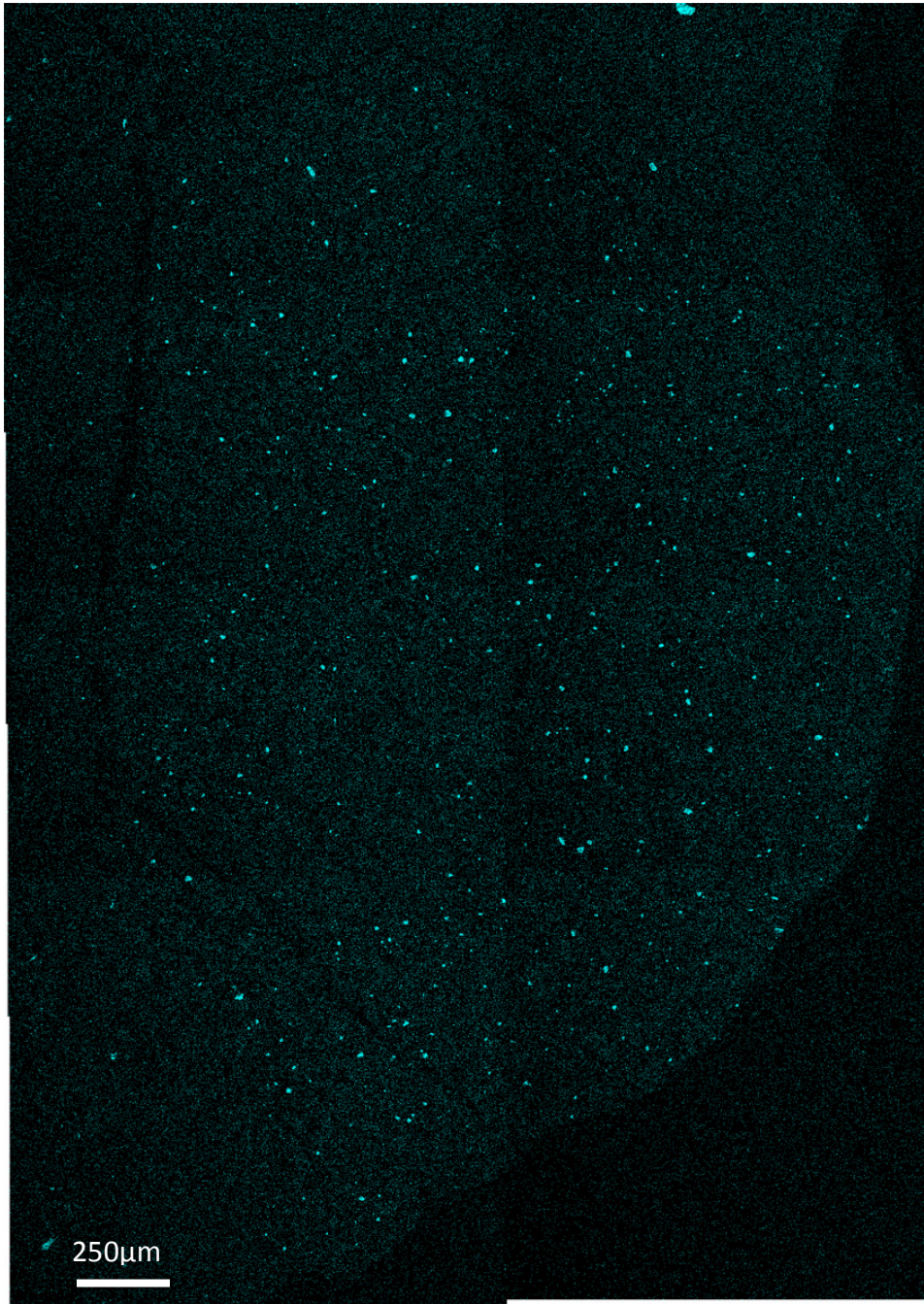
Cr



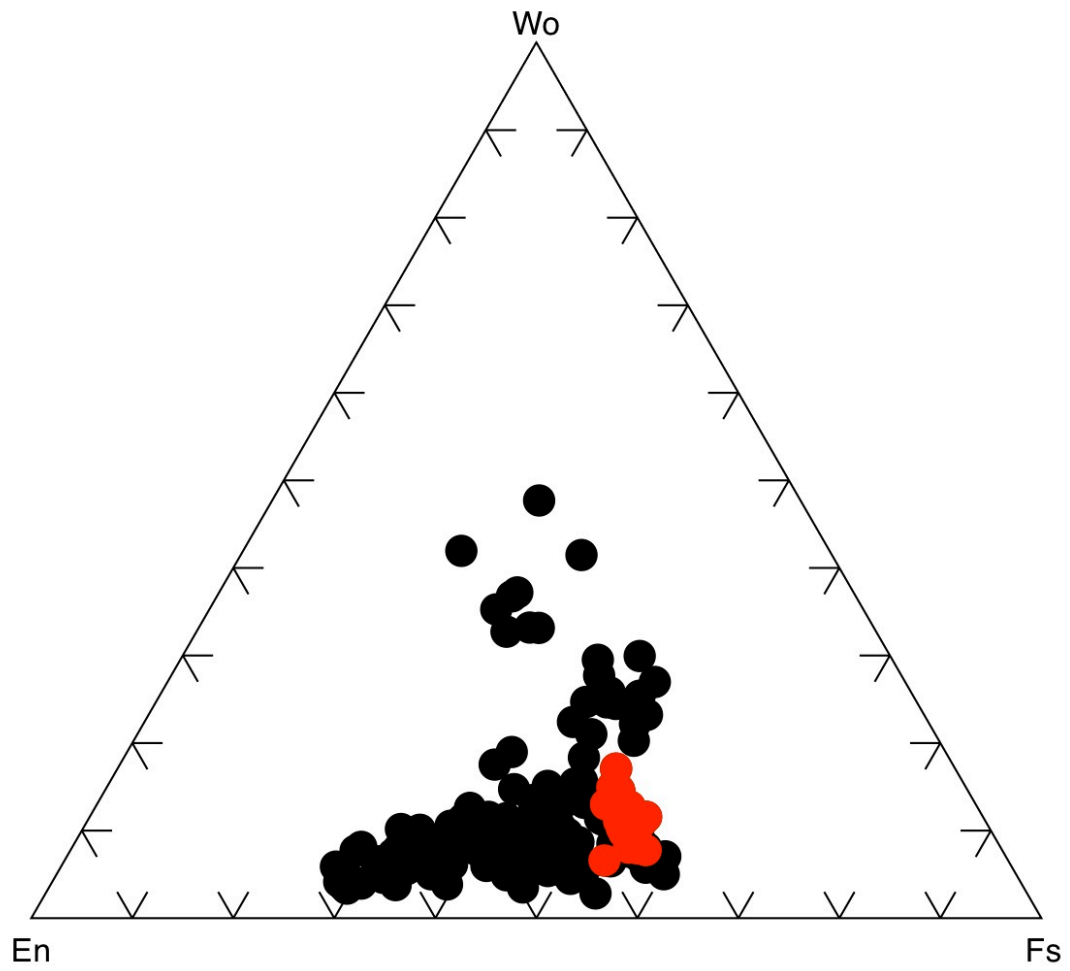
S



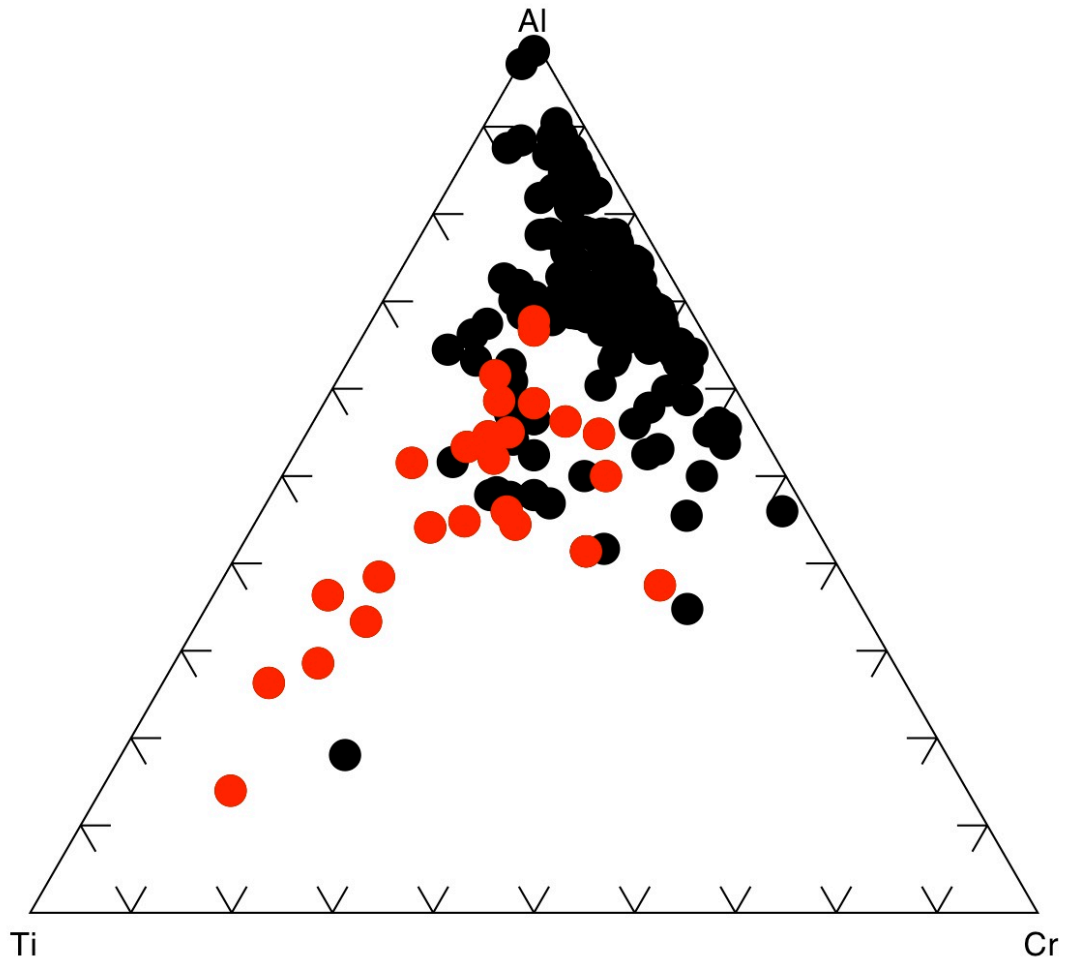
Ti



D3. Major element data of pyroxene (red) compared to all other samples



D4. Minor element data of pyroxene (red) compared to all other samples



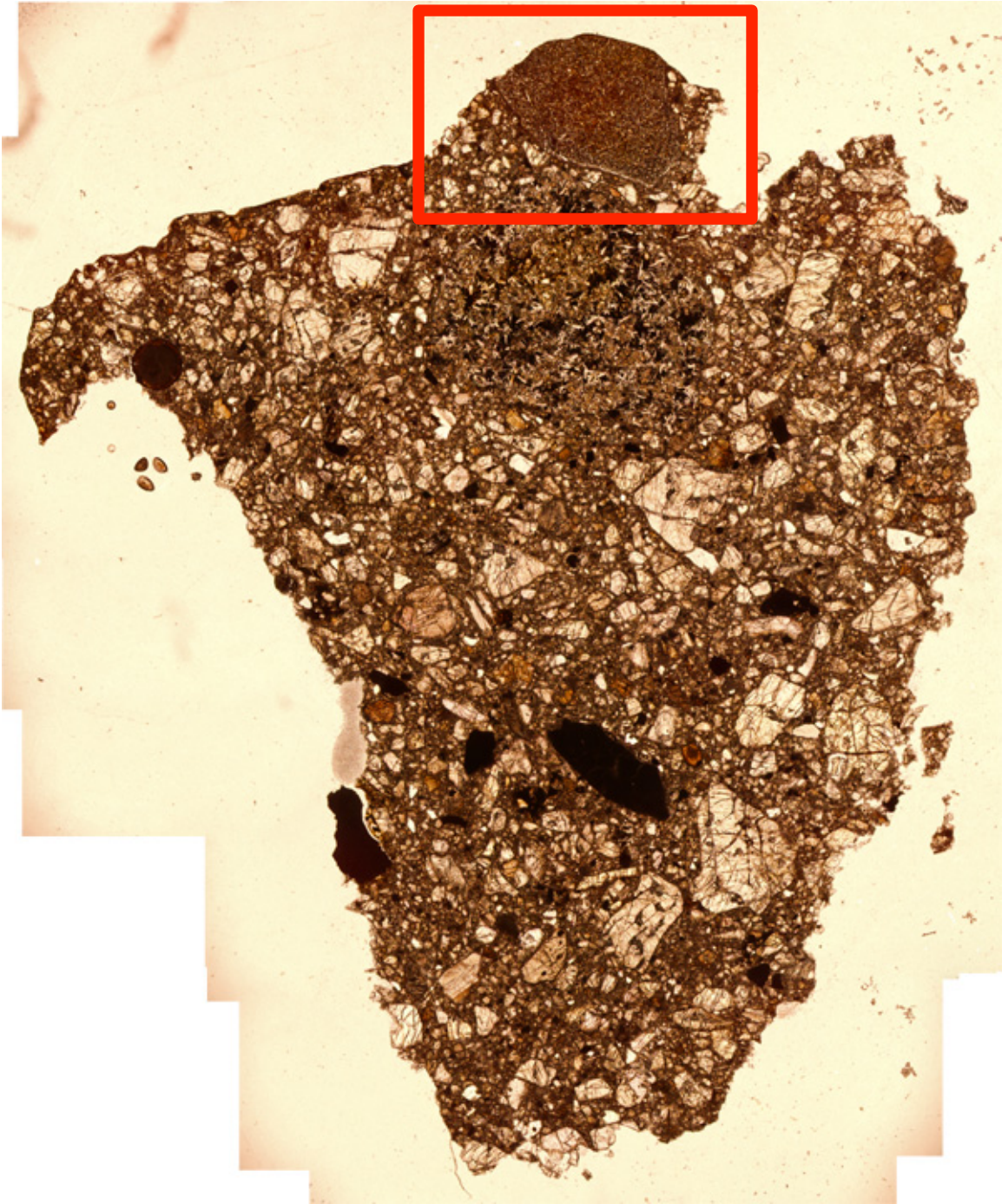
D5. Pyroxene analyses

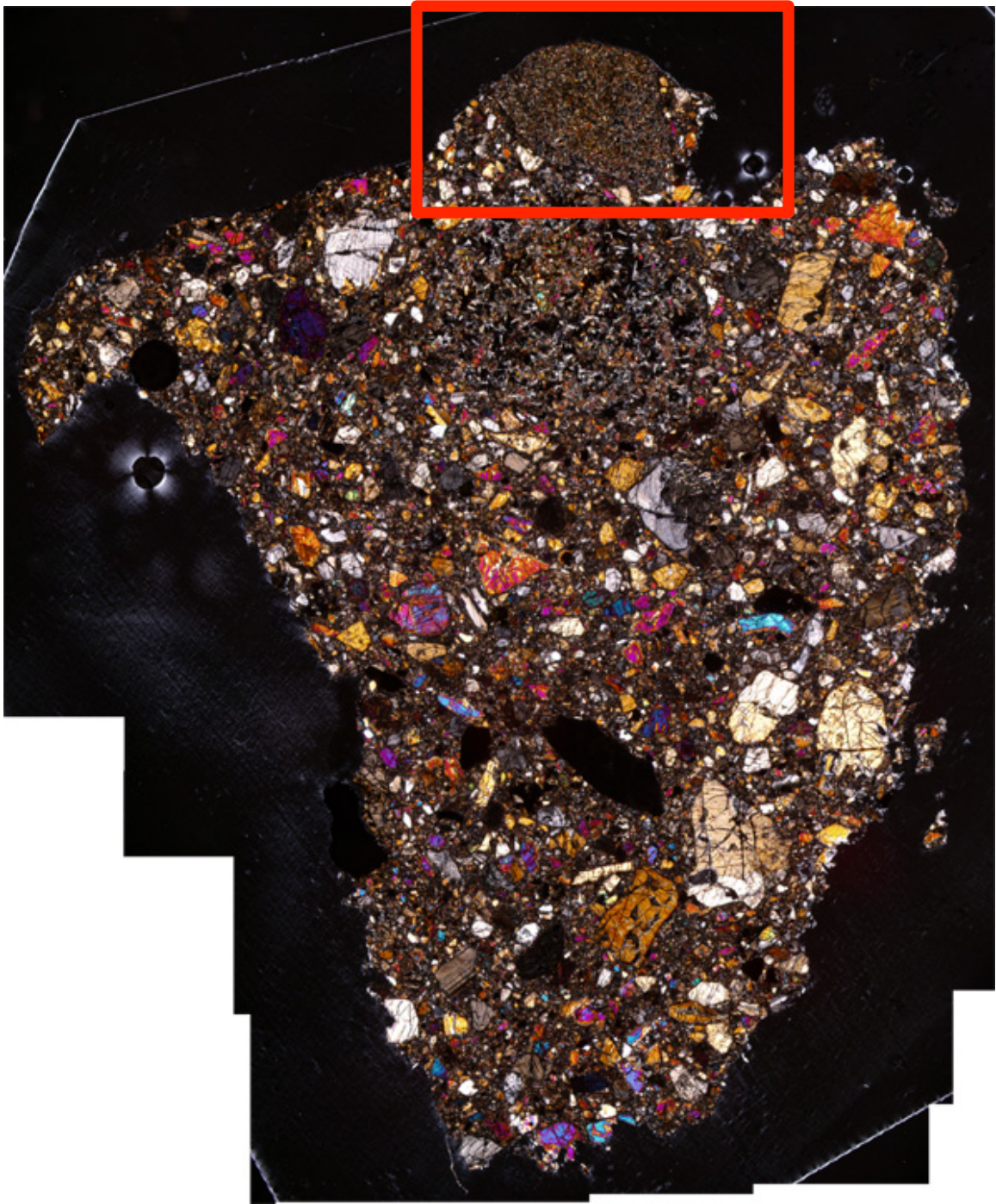
SiO ₂	47.66	47.30	48.93	48.67	48.73	48.75	47.79	48.01	48.88	48.58	48.53	47.39	48.32
CaO	5.23	5.55	3.04	5.20	4.02	6.51	5.71	6.06	4.65	4.99	3.63	7.86	4.95
Na ₂ O	0.04	n.d.	n.d.	0.01	0.04	0.03	n.d.	n.d.	0.01	0.03	n.d.	n.d.	0.01
MgO	12.26	11.39	13.26	11.79	12.03	11.28	11.44	12.28	12.39	11.76	11.95	11.09	11.81
TiO ₂	0.18	0.29	0.21	0.45	0.49	0.17	0.74	0.20	0.11	0.35	0.52	0.37	0.39
FeO	31.73	31.82	31.61	32.15	33.28	29.68	31.42	30.13	32.60	32.35	31.88	29.09	32.43
Al ₂ O ₃	0.32	0.34	0.35	0.34	0.22	0.37	0.35	0.27	0.21	0.28	0.17	0.37	0.23
K ₂ O	n.d.	n.d.	n.d.	n.d.	0.01	n.d.	0.01	0.01	0.01	n.d.	n.d.	0.01	0.01
MnO	1.10	1.09	1.12	1.12	1.15	0.98	1.04	1.06	1.17	1.09	1.13	0.97	1.14
Cr ₂ O ₃	0.29	0.16	0.11	0.18	0.16	0.29	0.15	0.45	0.12	0.18	0.12	0.27	0.13
Total	98.80	97.94	98.61	99.91	100.12	98.07	98.64	98.47	100.13	99.60	97.93	97.40	99.40
Si	1.93	1.94	1.97	1.95	1.95	1.97	1.94	1.94	1.95	1.95	1.97	1.94	1.95
Ca	0.23	0.24	0.13	0.22	0.17	0.28	0.25	0.26	0.20	0.22	0.16	0.35	0.21
Na	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Mg	0.74	0.70	0.79	0.70	0.72	0.68	0.69	0.74	0.71	0.72	0.68	0.68	0.71
Ti	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	n.d.	0.01	0.02	0.01	0.01
Fe	1.08	1.09	1.06	1.08	1.11	1.01	1.07	1.02	1.09	1.09	1.08	1.00	1.09
Al	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.01
K	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Mn	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.04
Cr	0.01	0.01	n.d.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	n.d.	0.01	n.d.
Total	4.05	4.04	4.01	4.03	4.02	4.01	4.03	4.04	4.03	4.03	4.00	4.03	4.03
Wo	11.09	12.00	6.59	11.13	8.58	14.37	12.35	12.99	9.82	10.71	8.04	17.08	10.60
En	36.27	34.28	39.96	35.13	35.83	34.59	34.51	36.61	36.43	35.11	36.83	33.56	35.18
Fs	52.64	53.71	53.45	53.74	55.59	51.04	53.14	50.40	53.75	54.18	55.14	49.36	54.21
SiO ₂	49.14	48.72	48.29	48.11	48.40	48.51	47.83	48.84	49.26	48.87	48.90	46.45	
CaO	3.76	4.70	5.92	6.94	5.61	5.61	3.48	5.18	5.51	4.81	6.94	5.50	
Na ₂ O	n.d.	n.d.	n.d.	n.d.	n.d.	0.03	n.d.	0.04	n.d.	0.02	n.d.	0.01	
MgO	12.22	11.92	11.48	11.70	11.53	11.72	11.38	11.43	11.72	11.43	11.78	11.38	
TiO ₂	0.23	0.15	0.40	0.28	0.18	0.25	0.77	0.22	0.17	0.18	0.24	2.26	
FeO	33.82	31.12	31.47	29.79	31.49	31.41	32.74	32.90	32.40	32.17	30.97	33.49	
Al ₂ O ₃	0.39	0.43	0.38	0.40	0.32	0.27	0.22	0.30	0.48	0.25	0.26	0.30	
K ₂ O	n.d.	0.01	n.d.	n.d.	n.d.	0.01	n.d.	n.d.	0.01	n.d.	n.d.	n.d.	
MnO	1.20	1.10	1.04	1.04	1.01	1.09	1.17	1.05	1.06	1.09	1.04	1.02	
Cr ₂ O ₃	0.17	0.17	0.14	0.19	0.16	0.21	0.12	0.15	0.17	0.13	0.32	0.37	
Total	100.93	98.32	99.11	98.45	98.69	99.10	97.70	100.10	100.77	98.94	100.44	100.78	
Si	1.95	1.97	1.95	1.95	1.96	1.96	1.96	1.96	1.96	1.97	1.95	1.87	
Ca	0.16	0.20	0.26	0.30	0.24	0.24	0.15	0.22	0.24	0.21	0.30	0.24	
Na	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Mg	0.72	0.72	0.69	0.71	0.70	0.70	0.70	0.68	0.69	0.69	0.70	0.68	
Ti	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.07	
Fe	1.12	1.05	1.06	1.01	1.07	1.06	1.12	1.10	1.08	1.09	1.03	1.13	
Al	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01	
K	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Mn	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
Cr	0.01	0.01	n.d.	0.01	0.01	0.01	n.d.	0.01	0.01	n.d.	0.01	0.01	
Total	4.03	4.02	4.02	4.03	4.03	4.03	4.01	4.03	4.03	4.01	4.04	4.05	
Wo	7.97	10.32	12.74	14.93	12.16	12.07	7.76	11.06	11.72	10.49	14.61	11.57	
En	36.06	36.39	34.40	35.02	34.68	35.11	35.29	34.01	34.61	34.71	34.50	33.35	
Fs	55.98	53.29	52.86	50.05	53.16	52.82	56.95	54.93	53.67	54.79	50.89	55.08	

D6. Plagioclase analyses

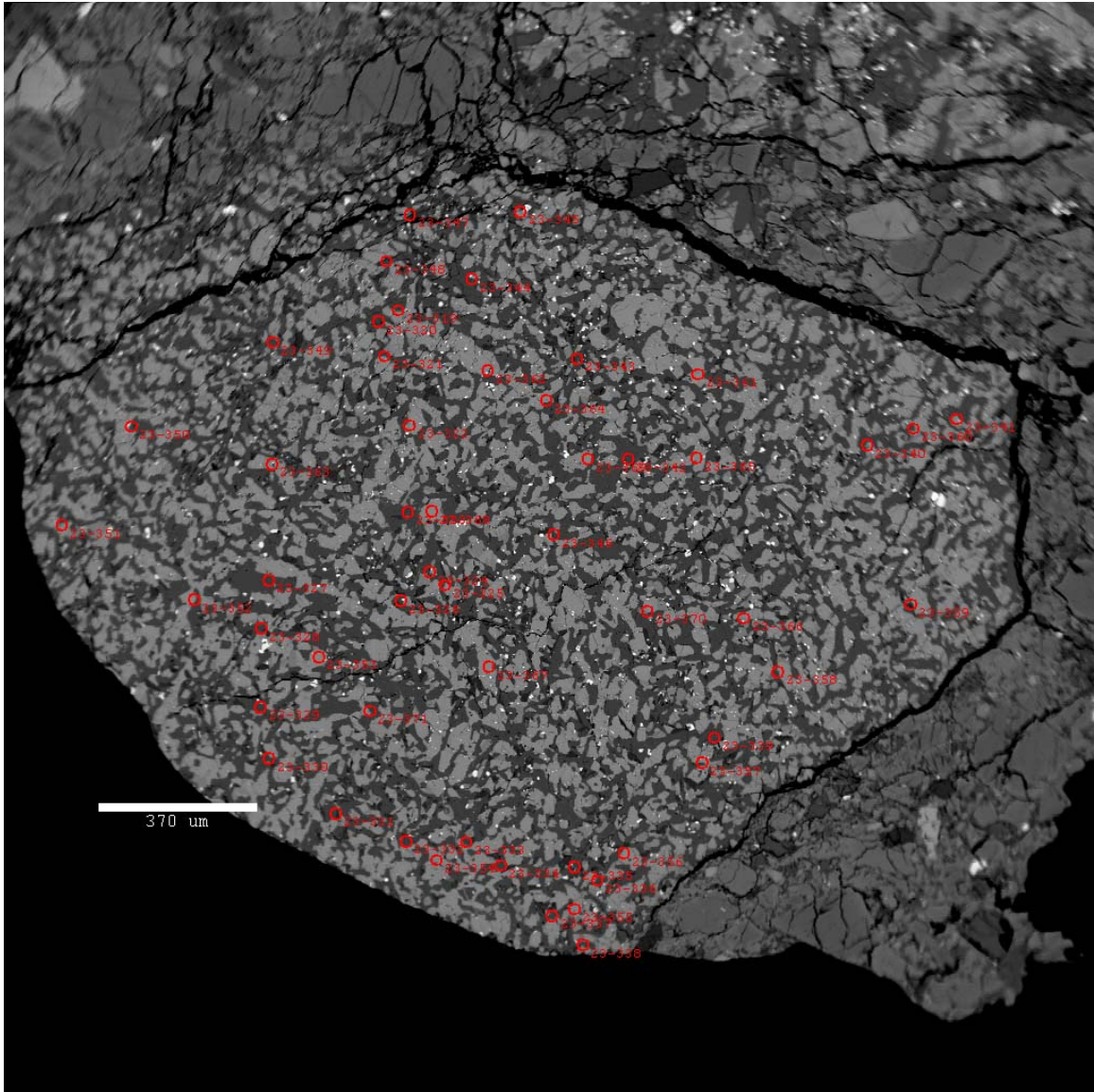
SiO ₂	43.77	44.27	44.39	43.48	42.63	44.18	43.52	43.93	42.73	43.35	43.69	43.86	43.18
CaO	18.22	18.11	18.37	18.31	17.13	18.31	17.83	18.18	18.45	18.35	18.10	18.08	18.34
Na ₂ O	1.22	1.29	1.26	1.25	1.18	1.23	1.33	1.21	1.03	1.22	1.24	1.33	1.17
MgO	n.d.	n.d.	0.02	n.d.	n.d.	n.d.	n.d.	0.03	n.d.	n.d.	n.d.	n.d.	n.d.
TiO ₂	n.d.	n.d.	0.02	n.d.	n.d.	0.08	0.01	n.d.	n.d.	0.02	n.d.	0.06	0.02
FeO	0.73	0.56	0.76	0.80	3.00	0.66	0.74	0.68	0.43	0.44	0.61	0.58	0.48
Al ₂ O ₃	34.26	34.59	35.04	34.78	33.02	34.65	34.04	34.63	34.81	34.61	34.41	34.05	34.71
K ₂ O	0.04	0.07	0.04	0.04	0.05	0.05	0.05	0.04	0.03	0.04	0.05	0.05	0.04
MnO	0.01	0.01	0.04	0.03	-0.01	0.02	0.02	0.02	0.02	n.d.	0.01	0.01	0.03
Cr ₂ O ₃	0.01	0.01	n.d.	0.01	0.01	-0.01	0.01	0.01	-0.01	0.03	0.02	0.01	0.01
Total	98.25	98.91	99.92	98.70	97.01	99.16	97.54	98.73	97.50	98.05	98.13	98.02	97.97
Si	2.07	2.07	2.06	2.05	2.06	2.07	2.07	2.06	2.03	2.05	2.06	2.07	2.04
Ca	0.92	0.91	0.91	0.92	0.89	0.92	0.91	0.92	0.94	0.93	0.92	0.92	0.93
Na	0.11	0.12	0.11	0.11	0.11	0.11	0.12	0.11	0.10	0.11	0.11	0.12	0.11
Mg	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Ti	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Fe	0.03	0.02	0.03	0.03	0.12	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
Al	1.91	1.91	1.92	1.93	1.88	1.91	1.91	1.92	1.95	1.93	1.92	1.90	1.94
K	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Mn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Cr	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Total	5.04	5.03	5.03	5.05	5.05	5.03	5.04	5.03	5.04	5.04	5.03	5.03	5.04
An	89.00	88.25	88.81	88.85	88.69	88.94	87.91	89.01	90.66	89.08	88.67	88.08	89.42
Ab	10.81	11.36	10.99	10.96	11.01	10.77	11.80	10.70	9.15	10.73	11.04	11.63	10.29
Or	0.19	0.39	0.19	0.19	0.30	0.29	0.29	0.29	0.19	0.19	0.29	0.29	0.29
SiO ₂	43.67	44.54	43.69	43.95	44.05	43.30	43.96	43.69	43.39	43.80	43.54	43.94	
CaO	18.27	18.10	18.28	17.91	18.03	18.45	18.15	18.75	18.38	18.12	18.09	18.15	
Na ₂ O	1.22	1.25	1.25	1.26	1.26	1.21	1.18	0.98	1.20	1.26	1.15	1.30	
MgO	n.d.	n.d.	0.03	n.d.	0.01	0.03	0.02	n.d.	n.d.	n.d.	0.01	0.04	
TiO ₂	0.02	0.02	0.03	0.02	0.01	0.04	0.01	0.01	-0.01	0.04	0.01	0.04	
FeO	0.58	0.61	0.69	0.62	0.55	0.51	0.84	0.52	0.53	0.43	0.59	0.51	
Al ₂ O ₃	34.80	34.89	34.48	34.10	34.49	34.40	34.47	35.01	34.72	34.47	34.22	34.12	
K ₂ O	0.05	0.05	0.05	0.06	0.04	0.04	0.04	0.03	0.05	0.05	0.05	0.04	
MnO	0.02	0.02	0.03	0.03	0.01	-0.01	n.d.	0.01	0.01	0.01	0.01	0.03	
Cr ₂ O ₃	0.01	n.d.	0.01	0.02	0.01	n.d.	0.01	0.01	-0.01	0.01	0.02	0.01	
Total	98.63	99.49	98.53	97.95	98.47	97.96	98.68	99.02	98.26	98.17	97.67	98.18	
Si	2.05	2.07	2.06	2.08	2.07	2.05	2.07	2.05	2.05	2.07	2.07	2.07	
Ca	0.92	0.90	0.92	0.91	0.91	0.94	0.91	0.94	0.93	0.92	0.92	0.92	
Na	0.11	0.11	0.11	0.12	0.12	0.11	0.11	0.09	0.11	0.12	0.11	0.12	
Mg	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Ti	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Fe	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	
Al	1.93	1.91	1.91	1.90	1.91	1.92	1.91	1.93	1.93	1.92	1.91	1.90	
K	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Mn	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Cr	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Total	5.04	5.02	5.04	5.02	5.03	5.04	5.03	5.03	5.04	5.03	5.03	5.03	
An	88.97	88.61	88.74	88.49	88.50	89.23	89.26	91.18	89.24	88.59	89.40	88.35	
Ab	10.74	11.10	10.97	11.22	11.21	10.58	10.55	8.62	10.47	11.12	10.31	11.45	
Or	0.29	0.29	0.29	0.29	0.29	0.19	0.20	0.19	0.29	0.29	0.29	0.19	

D7. QUE 99033,2B in plane polarized and cross-polarized light-1in. round (2.54cm). (The red box shows which grain this appendix is referring to)

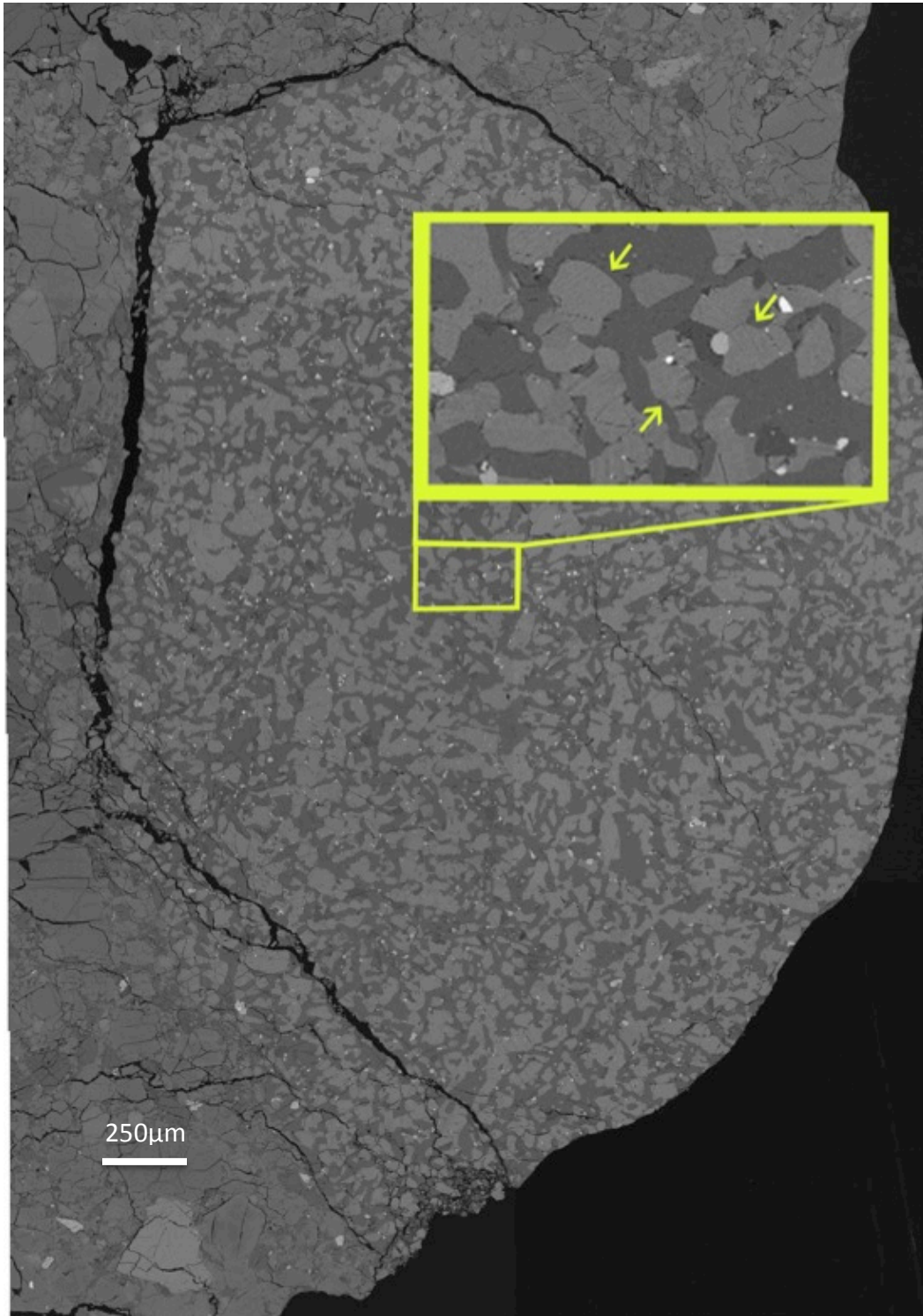




D8. BSE image with microprobe points (rotated 90° clockwise from original SEM map).



D9. BSE image zoomed in to show exsolution lamellae



QUE 99033,2B exhibiting exsolution lamellae of pyroxene. This figure is the same view as the SEM of QUE 99033, 2B