Supplementary Materials

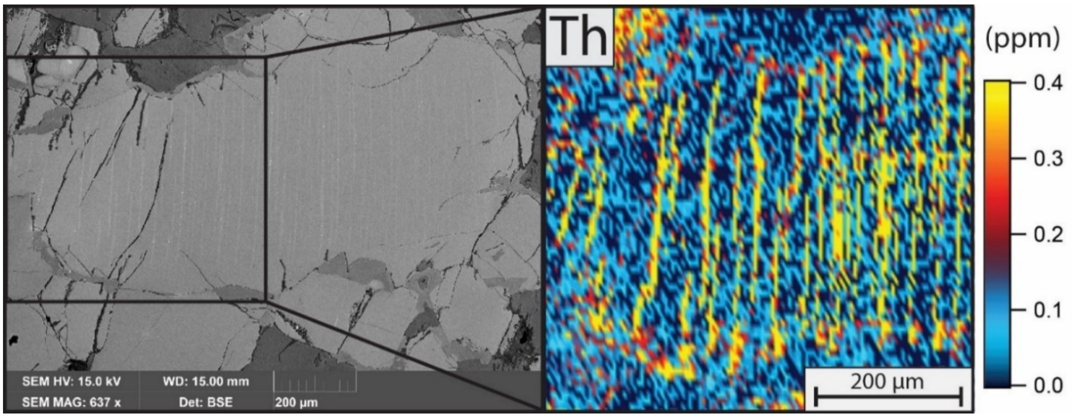

Figure S1. Clinopyroxene exsolution lamellae in orthopyroxene (sample 310.90a). Left: Backscattered electron image. Right: Semi-quantitative thorium distribution LA-ICP-MS map of the same grain. Clinopyroxene lamellae are highlighted by elevated Th concentrations.

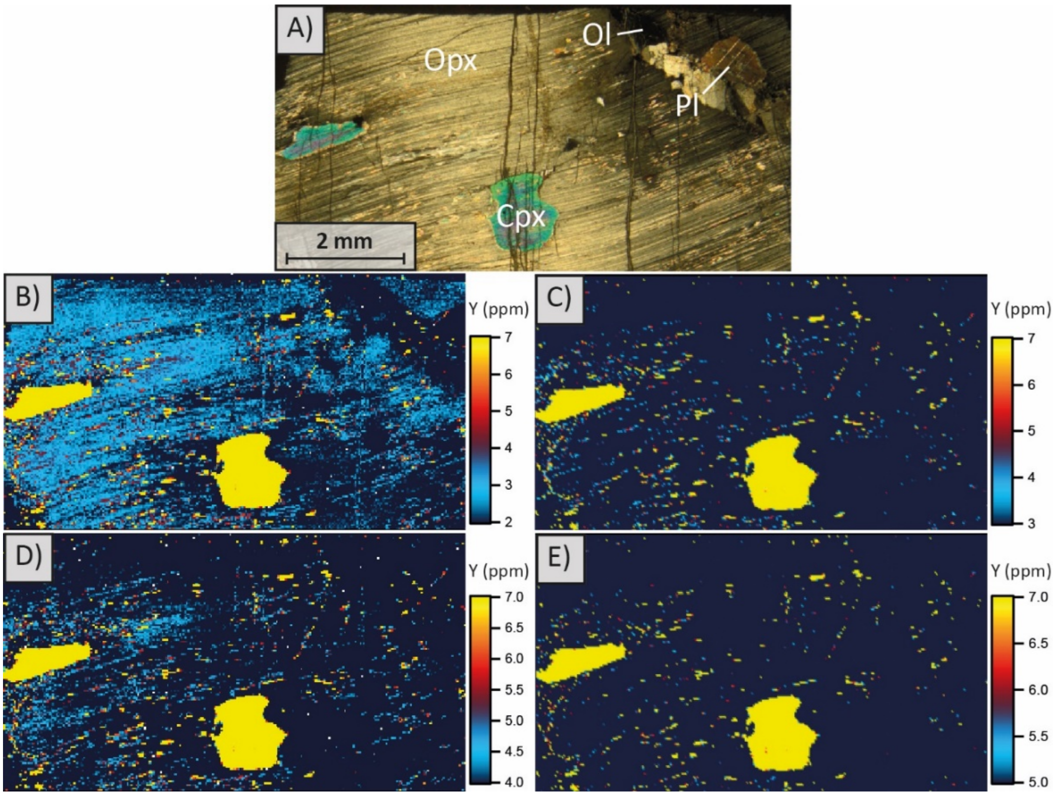

Figure S2. A) Cross polarised microscope image, sample 309.75b, Upper Pegmatoid, Opx (orthopyroxene), Ol (olivine), Pl (plagioclase), Cpx (clinopyroxene); B) - E) Semi-quantitative Y distribution maps of sample 309.75b with various lower Y limits and an upper Y limit of 7 ppm. B) Y range: 2 to 7 ppm; C) Y range: 3 to 7 ppm; D) Y range 4 to 7 ppm; E) Y range 5 to 7ppm; In order to use Y as a suitable filter element to exclude clinopyroxene, an upper Y level for Opx ROIs had to be found. As it is shown in Figure 7, orthopyroxene contains less than 5 ppm Y, while clinopyroxene grains yield higher Y contents >7 ppm in semi-quantitative maps. As a result, clinopyroxene grains can be best avoided by setting an upper Y level to 5–7 ppm. An example of an Opx ROI using the Y criteria < 6 ppm is shown in Figure 7F).

Table S1. Sample List.

Sample ID	Depth (m)	Subunit	Rock Type
277.35	277.29	HW Norite	Norite
307.00	306.90	HW Anorthosite	Anorthosite/Gabbronorite
308.90	308.85	Upper Distal	Gabbronorite
309.75b	309.51	Upper Pegmatoid	Orthopyroxenite
309.75a	309.62	Upper Pegmatoid	Ol-Orthopyroxenite
310.00a	309.84	Leader Seam	Chromitite
310.00b	309.95	Upper Split	Chr-Pyroxenite
310.90b	310.82	Lower Split	Ol-Pyroxenite/Ol-Norite
310.90a	310.88	Lower Split/Main Seam	Melanorite/Chromitite
311.55	311.56	Lower Pegmatoid	Troctolite/Ol-Melanorite
313.25	313.21	Lower Pegmatoid	Norite
314.10b	314.12	FW Norite	Cpx-Norite

Table S2. Conditions of the microprobe pyroxene analysis at the University of Tübingen. Standard materials from Astimex Scientific Limited.

Element	Crystal	Standard	Line	Peak Pos [mm]
Na	TAP	A_Albit	Kα	129.489
Al	TAP	A_Plagioklas	Kα	90.650
Ca	PETJ	A_Diopsid	Kα	107.494
Cr	LIFH	M_Cr	Kα	159.411
Mg	TAP	A_Olivin	Kα	107.494
Si	TAP	A_Olivin	Kα	77.442
Ti	PETJ	A_SrTiO3	Kα	87.883
Fe	LIFH	A_Olivin	Kα	134.935
Mn	PETJ	A_Rhodonite	Kα	66.967

Table S3. Characteristic parameters for LA-ICP-MS mapping experiments.

LA-MS Connection	In-house device	ARIS
Square Beam Size	35–80 µm	10–35 µm
Repetition Rate	12 Hz	40–50 Hz
Scanning Speed	15–60 µm/s	60–200 µm/s
Fluence	1.5–2.5 J/cm^2	2.75 J/cm^2
Washout Time	80 s	10 s
Dwell times:		
^{29}Si	10 ms	20 ms
^{51}V	20 ms	20 ms
^{53}Cr	20 ms	20 ms
^{60}Ni	20 ms	20 ms
^{89}Y	20 ms	20 ms
^{232}Th	35 ms	40 ms
^{139}La	40 ms	-
Total Dwell time	165 ms	140 ms

Table S4. Typical laser parameters of the experiments for different LA-MS connection devices and map sizes. ARIS (Aerosol Rapid Introduction System, (Van Acker, 2016) [39]).

LA-MS Connection	In-house device		ARIS	
Map Size	<6 mm^2	>6 mm^2	<6 mm^2	>6 mm^2
Scanning Speed	15–25 µm/s	60 µm/s	60 µm/s	200 µm/s
Beam Diameter	35 µm	80 µm	10 µm	35 µm
Repetition Rate	12 Hz	12 Hz	40 Hz	50 Hz

Table 5. Comparison of BCR-2G reference standard material analyses and preferred values (GeoRem).

Data Source		Cr (ppm)	Ni (ppm)	V (ppm)	Y (ppm)	Th (ppm)
GeoRem	BCR-2G	17	13	425	35	5.9
DEC 09	±2SD	4	4	36	6	0.6
Average This study	BCR-2G	15	12	404	32	6
	±2SD	1.4	1.54	55.7	4.1	0.6
	Precision in %	5	6	7	6	5

Table S6. Internal errors and LODs of analysed trace elements.

	Cr	Ni	V	Y	Th
2 SE error	<30 ppm	<20 ppm	<2 ppm	<0.08 ppm	<8 ppb
LOD	<0.4 ppm	<0.067 ppm	<0.043 ppm	<1.7 ppb	<1.3 ppb

Table S7. Trace element data for orthopyroxene 'core' ROI.

Sample	Depth (m)	Cr (ppm)	V (ppm)	Ni (ppm)	Y (ppm)	Th (ppm)
Map3_277.35	277.29	2340	145	637	3.25	0.201
Map7_277.35	277.29	2262	149	634	3.70	0.198
Map1 LR_307.00	306.90	2362	146	511	2.23	0.076
Map1 L_307.00	306.90	2458	142	497	1.51	0.089
Map1 UM_307.00	306.90	2579	147	509	1.79	0.076
Map1_308.90	308.85	2203	129	575	2.98	0.173
Map2_308.90	308.85	2107	131	570	3.21	0.183
Map3_308.90	308.85	2458	142	557	2.77	0.192
Map1_309.75b	309.51	2201	132	873	2.50	0.199
Map2_309.75b	309.51	2429	138	922	2.90	0.111
Map3_309.75b	309.51	2652	146	1002	3.49	0.281
Map2_309.75a	309.62	2551	117	791	2.19	0.215
Map3_309.75a	309.62	2251	108	784	1.82	0.191
MapX_309.75a	309.62	2523	108	737	2.02	0.239
Map5_309.75a	309.62	2652	124	807	2.55	0.280
Map1_310.00b	309.95	2266	74	760	2.18	0.164
Map2_310.00b	309.95	2653	76	875	2.51	0.212
Map3_310.00b	309.95	2306	81	801	2.52	0.220
Map5_310.00b	309.95	2868	84	831	3.17	0.268
Map6_310.00b	309.95	3163	88	829	3.22	0.289
Map4_310.90a_LS	310.75	2685	103	701	2.46	0.068
Map5_310.90a_LS	310.75	2687	108	708	2.26	0.074
Map6_310.90a_LS	310.75	2956	113	702	2.67	0.056
Map1_310.90a_rim	311.00	2979	116	798	3.93	0.325
Map2_310.90a_rim	311.00	4096	132	841	3.62	0.315
Map3_310.90a_MS	311.10	3541	85	693	2.31	0.163
Map3_310.90a_MS	311.10	3515	86	720	2.52	0.140
Map3_310.90a_MS	311.10	3674	85	696	2.49	0.119
Map1_311.55	311.56	2692	119	752	3.95	0.354
Map2_311.55	311.56	2596	120	746	4.09	0.553
Map1_313.25	313.21	2670	99	691	2.10	0.113
Map7_313.25	313.21	2643	97	654	2.46	0.112
Map8_313.25	313.21	2436	92	652	2.19	0.096
Map3_314.10b	314.12	2633	106	664	3.46	0.613
Map4_314.10b	314.12	2487	102	563	3.54	0.344

Table 8. Major element concentrations of orthopyroxene, En (Enstatite), Fs (Ferrosilite) and Wo (Wollastonite) components.

Sample ID	Depth (m)	SiO_2 (wt. %)	TiO_2 (wt. %)	Al_2O_3 (wt. %)	Cr_2O_3 (wt. %)	FeO (wt. %)	MnO (wt. %)	MgO (wt. %)	CaO (wt. %)	Na_2O (wt. %)	Total	En	Fs	Wo	Pyx Type
27735_P1	277.29	54.64	0.18	1.23	0.40	14.18	0.00	27.78	2.61	0.05	101.07	0.76	0.19	0.05	pigeonite
27735_P1	277.29	54.96	0.15	1.16	0.43	14.41	0.00	28.14	1.70	0.05	101.00	0.76	0.20	0.03	enstatite
27735_P1	277.29	55.07	0.15	0.99	0.41	14.33	0.00	28.23	1.84	0.11	101.13	0.77	0.20	0.04	enstatite
27735_P4	277.29	55.13	0.17	1.10	0.33	13.96	0.00	27.75	2.62	0.04	101.10	0.75	0.20	0.05	pigeonite
27735_P4	277.29	55.17	0.21	0.97	0.34	14.83	0.00	28.73	0.89	0.09	101.23	0.78	0.20	0.02	enstatite
27735_P4	277.29	55.32	0.17	1.01	0.33	14.93	0.00	28.76	0.91	0.05	101.48	0.78	0.21	0.02	enstatite
27735_P3	277.29	55.62	0.20	1.13	0.38	15.14	0.00	28.83	0.65	0.00	101.95	0.77	0.22	0.01	enstatite
27735_P3	277.29	55.62	0.20	1.13	0.38	15.14	0.00	28.83	0.65	0.00	101.95	0.77	0.22	0.01	enstatite
27735_P3	277.29	55.60	0.14	1.17	0.41	15.33	0.00	28.78	0.60	0.09	102.12	0.78	0.21	0.01	enstatite
27735_P2	277.29	55.04	0.16	1.29	0.40	14.78	0.00	28.40	1.13	0.04	101.24	0.77	0.21	0.02	enstatite
27735_P2	277.29	55.25	0.16	1.18	0.37	15.41	0.00	28.62	0.58	0.07	101.64	0.77	0.21	0.01	enstatite
27735_P2	277.29	54.95	0.16	1.12	0.41	14.92	0.00	28.63	0.67	0.06	100.92	0.78	0.21	0.01	enstatite
27735_P5	277.29	55.40	0.20	1.15	0.41	14.80	0.00	28.65	0.89	0.01	101.51	0.77	0.21	0.02	enstatite
27735_P5	277.29	54.91	0.21	1.20	0.39	14.95	0.00	28.74	0.58	0.06	101.04	0.78	0.21	0.01	enstatite
27735_P5	277.29	55.02	0.19	1.08	0.42	14.84	0.00	28.84	0.68	0.04	101.11	0.78	0.21	0.01	enstatite
27735_P6	277.29	54.86	0.16	1.93	0.35	14.94	0.00	28.52	0.95	0.05	101.76	0.78	0.21	0.02	enstatite
27735_P6	277.29	54.57	0.16	1.81	0.36	13.93	0.00	26.86	2.71	0.10	100.50	0.74	0.21	0.05	pigeonite
27735_P6	277.29	54.85	0.16	1.90	0.37	15.00	0.00	28.57	0.89	0.00	101.74	0.77	0.21	0.02	enstatite
27735_P7	277.29	54.30	0.17	2.27	0.44	12.77	0.00	25.78	4.62	0.15	100.50	0.71	0.19	0.09	pigeonite
27735_P7	277.29	55.27	0.22	2.40	0.44	14.47	0.00	28.67	0.94	0.03	102.44	0.77	0.21	0.02	enstatite
27735_P7	277.29	54.30	0.17	2.27	0.44	12.77	0.00	25.78	4.62	0.15	100.50	0.71	0.19	0.09	pigeonite
30700_P4	306.9	55.38	0.12	1.41	0.51	14.77	0.00	27.92	1.83	0.06	102.00	0.75	0.21	0.04	enstatite
30700_P4	306.9	55.12	0.14	1.49	0.44	14.69	0.00	27.35	2.28	0.02	101.53	0.74	0.22	0.04	enstatite
30700_P4	306.9	55.47	0.12	1.52	0.44	15.16	0.00	28.14	1.15	0.03	102.03	0.76	0.22	0.02	enstatite
30700_P5	306.9	55.44	0.18	1.80	0.55	15.27	0.00	28.01	1.52	0.01	102.78	0.75	0.22	0.03	enstatite
30700_P5	306.9	55.37	0.12	1.90	0.53	15.03	0.00	27.85	1.65	0.08	102.53	0.75	0.22	0.03	enstatite
30700_P5	306.9	55.12	0.15	1.90	0.50	15.37	0.00	28.00	1.35	0.00	102.39	0.76	0.22	0.03	enstatite
30890_P1	308.85	53.10	0.12	1.47	0.52	15.42	0.00	27.15	0.71	0.05	98.54	0.76	0.22	0.01	enstatite
30890_P1	308.85	52.75	0.10	1.59	0.42	15.21	0.00	26.39	1.28	0.15	97.89	0.75	0.22	0.03	enstatite
30890_P1	308.85	52.88	0.12	1.49	0.44	15.09	0.00	26.53	1.35	0.02	97.92	0.75	0.22	0.03	enstatite
30890_P2	308.85	52.90	0.24	1.29	0.37	14.88	0.00	25.93	2.48	0.10	98.19	0.73	0.22	0.05	pigeonite
30890_P2	308.85	52.72	0.18	1.29	0.35	15.36	0.00	26.34	1.71	0.08	98.03	0.75	0.22	0.03	enstatite
30890_P2	308.85	52.67	0.20	1.46	0.42	15.04	0.00	26.49	1.55	0.09	97.92	0.75	0.22	0.03	enstatite
30890_P4	308.85	53.16	0.12	1.42	0.47	15.31	0.00	26.81	1.52	0.06	98.87	0.75	0.22	0.03	enstatite
30890_P4	308.85	52.89	0.11	1.52	0.52	14.77	0.00	26.28	2.33	0.06	98.48	0.74	0.21	0.05	enstatite
30890_P4	308.85	52.85	0.19	1.52	0.52	14.80	0.00	26.32	2.32	0.07	98.59	0.74	0.21	0.05	enstatite
30890_P5	308.85	53.99	0.12	1.16	0.22	15.85	0.00	27.55	0.67	0.00	99.56	0.76	0.23	0.01	enstatite
30890_P5	308.85	53.94	0.17	1.18	0.26	15.71	0.00	27.62	0.68	0.06	99.62	0.76	0.22	0.01	enstatite
30890_P5	308.85	53.99	0.12	1.16	0.22	15.85	0.00	27.55	0.67	0.00	99.56	0.76	0.23	0.01	enstatite
309.75b_1_1	309.43	54.76	0.15	1.23	0.33	12.09	0.32	28.00	2.35	0.04	99.27	0.77	0.19	0.05	enstatite
309.75b_1_2	309.43	54.88	0.13	1.47	0.47	12.53	0.25	28.69	1.16	0.01	99.59	0.78	0.19	0.02	enstatite
309.75b_1_3	309.43	54.87	0.14	1.43	0.38	12.66	0.29	28.53	0.86	0.01	99.17	0.79	0.20	0.02	enstatite
309.75b_1_5	309.43	55.18	0.10	1.29	0.37	12.35	0.30	29.01	0.61	0.00	99.21	0.80	0.19	0.01	enstatite
309.75b_1_6	309.43	54.99	0.14	1.37	0.26	12.13	0.27	29.17	0.72	0.00	99.06	0.80	0.19	0.01	enstatite
309.75b_1_7	309.43	54.79	0.16	1.22	0.33	13.35	0.31	28.72	0.53	0.00	99.41	0.78	0.20	0.01	enstatite

309.75b_1_8	309.43	55.46	0.16	1.26	0.40	12.56	0.25	28.28	1.37	0.00	99.74	0.78	0.19	0.03	enstatite
309.75b_1_9	309.43	54.38	0.15	1.48	0.44	12.53	0.25	27.86	1.94	0.03	99.06	0.77	0.19	0.04	enstatite
309.75a_X_1	309.62	55.53	0.06	0.86	0.17	12.72	0.21	30.09	0.65	0.00	100.29	0.810	0.177	0.013	enstatite
309.75a_X_2	309.62	54.89	0.08	1.43	0.42	12.12	0.33	28.28	2.67	0.03	100.25	0.773	0.175	0.052	pigeonite
309.75a_X_3	309.62	54.51	0.13	1.44	0.41	12.26	0.28	28.14	2.57	0.04	99.78	0.774	0.175	0.051	pigeonite
309.75a_X_5	309.62	55.83	0.12	1.18	0.22	12.84	0.3	30.05	0.64	0.03	101.21	0.808	0.180	0.012	enstatite
309.75a_X_6	309.62	55.12	0.13	1.58	0.39	12.53	0.27	29.04	1.89	0.04	100.99	0.790	0.173	0.037	enstatite
309.75a_5_1	309.62	54.48	0.03	1.22	0.22	12.99	0.3	29.46	0.47	0.01	99.18	0.810	0.181	0.009	enstatite
309.75a_5_2	309.62	54.26	0.23	1.49	0.49	12.35	0.28	28.37	2.55	0.05	100.07	0.784	0.166	0.051	pigeonite
309.75a_5_3	309.62	54.07	0.10	1.43	0.39	12.37	0.35	28.75	2.07	0.00	99.53	0.796	0.163	0.041	enstatite
309.75a_5_4	309.62	54.28	0.14	1.59	0.40	12.48	0.26	28.22	2.77	0.02	100.16	0.778	0.167	0.055	pigeonite
309.75a_5_5	309.62	54.4	0.12	1.45	0.56	12.49	0.23	28.86	1.69	0.01	99.81	0.793	0.174	0.033	enstatite
309.75a_5_6	309.62	54.73	0.14	1.48	0.39	12.6	0.25	28.97	2.01	0.00	100.57	0.791	0.170	0.039	enstatite
309.75a_5_7	309.62	55.03	0.22	1.21	0.23	12.98	0.22	29.86	0.65	0.00	100.40	0.809	0.178	0.013	enstatite
309.75a_2_1	309.62	55.04	0.05	1.40	0.20	12.94	0.27	29.53	0.63	0.00	100.06	0.803	0.184	0.012	enstatite
309.75a_2_2	309.62	54.84	0.09	1.20	0.31	13.29	0.38	29.49	0.53	0.01	100.14	0.806	0.184	0.010	enstatite
309.75a_2_3	309.62	54.95	0.14	1.46	0.43	12.72	0.24	28.53	1.74	0.01	100.22	0.776	0.190	0.034	enstatite
309.75a_2_4	309.62	54.61	0.10	1.50	0.46	12.66	0.19	28.52	2.08	0.00	100.12	0.780	0.179	0.041	enstatite
309.75a_2_5	309.62	56.75	0.00	0.15	0.00	12.24	0.22	31.5	0.04	0.00	100.90	0.831	0.168	0.001	enstatite
309.75a_2_6	309.62	55.03	0.19	1.46	0.33	12.86	0.22	28.89	1.56	0.00	100.54	0.784	0.186	0.030	enstatite
309.75a_3_1	309.62	54.89	0.07	1.35	0.41	13.29	0.24	29.12	1.13	0.00	100.50	0.795	0.183	0.022	enstatite
309.75a_3_2	309.62	54.75	0.19	1.52	0.40	12.8	0.24	29.16	1.73	0.00	100.79	0.795	0.171	0.034	enstatite
309.75a_3_3	309.62	55.69	0.11	1.42	0.40	13.16	0.3	29.53	0.93	0.01	101.55	0.793	0.189	0.018	enstatite
309.75a_3_4	309.62	54.64	0.13	1.49	0.39	12.83	0.29	28.64	1.76	0.00	100.17	0.784	0.182	0.035	enstatite
309.75a_3_5	309.62	54.88	0.04	1.14	0.22	13.15	0.36	29.55	0.72	0.00	100.06	0.808	0.178	0.014	enstatite
310.00b_1_1	309.95	55.24	0.06	1.19	N/A	10.99	0.27	31.41	0.72	0.02	99.90	0.85	0.13	0.01	enstatite
310.00b_1_2	309.95	54.45	0.07	1.37	N/A	10.37	0.20	30.06	1.78	0.05	98.35	0.83	0.14	0.04	enstatite
310.00b_1_3	309.95	56.13	0.07	0.79	N/A	10.73	0.17	31.93	0.73	0.11	100.66	0.86	0.13	0.01	enstatite
310.00b_1_3	309.95	56.90	0.15	0.99	N/A	10.98	0.23	32.52	0.78	0.02	102.57	0.85	0.13	0.01	enstatite
310.00b_1_3	309.95	56.64	0.13	1.12	N/A	10.86	0.21	32.53	0.73	0.06	102.28	0.86	0.13	0.01	enstatite
310.00b_1_4	309.95	53.83	0.14	1.16	N/A	10.07	0.22	30.95	0.73	0.00	97.10	0.86	0.13	0.01	enstatite
310.00b_1_4	309.95	55.55	0.07	1.07	N/A	10.70	0.23	31.40	0.89	0.02	99.93	0.85	0.14	0.02	enstatite
310.00b_2_1	309.95	55.56	0.05	1.20	N/A	10.25	0.23	32.09	0.43	0.04	99.85	0.87	0.13	0.01	enstatite
310.00b_2_2	309.95	54.89	0.13	1.19	N/A	10.12	0.18	30.75	1.83	0.03	99.12	0.84	0.13	0.04	enstatite
310.00b_2_2	309.95	55.02	0.04	1.03	N/A	10.49	0.23	31.33	1.10	0.04	99.28	0.85	0.12	0.02	enstatite
310.00b_2_2	309.95	55.92	0.04	0.92	N/A	10.66	0.21	31.71	0.71	0.10	100.27	0.85	0.13	0.01	enstatite
310.00b_2_2	309.95	54.32	0.10	1.23	N/A	10.55	0.25	31.02	0.38	0.06	97.91	0.86	0.14	0.01	enstatite
310.00b_2_3	309.95	56.59	0.04	1.02	N/A	10.67	0.25	32.35	0.96	0.06	101.94	0.86	0.12	0.02	enstatite
310.00b_3_1	309.95	54.30	0.11	1.27	N/A	10.94	0.22	30.94	0.60	0.00	98.38	0.85	0.14	0.01	enstatite
310.00b_3_1	309.95	54.56	0.07	1.15	N/A	11.11	0.27	31.29	0.47	0.05	98.97	0.86	0.13	0.01	enstatite
310.00b_3_1	309.95	56.42	0.10	1.27	N/A	10.89	0.19	31.78	1.56	0.00	102.21	0.84	0.13	0.03	enstatite
310.00b_3_2	309.95	53.90	0.10	1.43	N/A	11.00	0.28	30.13	1.38	0.09	98.31	0.84	0.13	0.03	enstatite
310.00b_3_2	309.95	53.92	0.08	1.48	N/A	11.72	0.26	30.32	1.05	0.00	98.83	0.84	0.14	0.02	enstatite
310.00b_3_2	309.95	54.79	0.10	1.33	N/A	11.37	0.22	30.64	0.90	0.00	99.35	0.84	0.15	0.02	enstatite
310.00b_6_1	309.95	53.70	0.08	1.35	N/A	11.34	0.28	30.55	0.59	0.05	97.94	0.85	0.13	0.01	enstatite
310.00b_6_1	309.95	55.45	0.10	1.23	N/A	11.18	0.19	31.69	0.54	0.00	100.38	0.85	0.14	0.01	enstatite
310.00b_6_2	309.95	53.92	0.14	1.12	N/A	11.25	0.24	30.58	0.51	0.07	97.83	0.85	0.14	0.01	enstatite
310.00b_6_2	309.95	54.52	0.03	1.10	N/A	11.20	0.28	30.67	0.66	0.10	98.56	0.85	0.14	0.01	enstatite
310.00b_6_2	309.95	56.65	0.13	1.20	N/A	11.96	0.23	31.90	0.70	0.06	102.83	0.84	0.14	0.01	enstatite

310.00b_6_2	309.95	54.42	0.13	1.22	N/A	11.15	0.23	30.16	1.64	0.11	99.06	0.83	0.13	0.03	enstatite
310.00b_5_1	309.95	55.30	0.16	1.45	N/A	10.70	0.22	30.72	1.74	0.06	100.35	0.83	0.13	0.03	enstatite
310.00b_5_1	309.95	55.13	0.07	1.11	N/A	11.21	0.25	31.18	0.41	0.03	99.39	0.85	0.14	0.01	enstatite
310.00b_5_1	309.95	54.41	0.12	1.25	N/A	11.35	0.24	30.73	0.67	0.07	98.84	0.85	0.14	0.01	enstatite
310.90a_1_1	311.10	56.05	0.14	1.35	0.46	7.77	0.20	33.07	0.67	0.02	99.72	0.89	0.10	0.01	enstatite
310.90a_1_2	311.10	56.07	0.15	1.14	0.38	7.61	0.23	33.22	0.53	0.02	99.34	0.88	0.10	0.01	enstatite
310.90a_2_1	310.75	55.55	0.09	1.34	0.55	9.48	0.24	30.97	1.32	0.03	99.57	0.84	0.14	0.03	enstatite
310.90a_2_2	310.75	55.32	0.12	1.29	0.53	8.94	0.23	31.02	1.64	0.02	99.12	0.84	0.13	0.03	enstatite
310.90a_2_3	311.10	56.87	0.06	0.50	0.22	7.55	0.18	33.97	0.20	0.00	99.55	0.89	0.10	0.00	enstatite
310.90a_2_4	311.10	56.00	0.11	1.21	0.48	7.81	0.22	33.06	0.62	0.01	99.52	0.88	0.11	0.01	enstatite
310.90a_2_5	311.10	55.89	0.14	1.27	0.48	7.88	0.20	33.14	0.57	0.00	99.56	0.88	0.10	0.01	enstatite
310.90a_3_1	311.10	56.12	0.13	1.35	0.38	7.87	0.23	33.40	0.24	0.00	99.71	0.89	0.11	0.00	enstatite
310.90a_4_1	311.10	55.82	0.11	1.34	0.40	8.60	0.23	32.26	0.56	0.01	99.34	0.86	0.13	0.01	enstatite
310.90a_4_2	311.10	55.20	0.13	1.54	0.57	8.98	0.20	30.79	1.85	0.04	99.30	0.83	0.13	0.04	enstatite
310.90a_4_3	311.10	56.40	0.10	1.03	0.31	7.77	0.18	33.27	0.38	0.01	99.45	0.88	0.11	0.01	enstatite
310.90a_5_1	310.75	55.15	0.15	1.15	0.49	11.01	0.26	29.33	1.86	0.04	99.44	0.80	0.17	0.04	enstatite
310.90a_5_2	310.75	55.20	0.16	1.28	0.51	11.17	0.25	29.54	1.02	0.01	99.13	0.81	0.17	0.02	enstatite
310.90a_5_3	310.75	55.47	0.16	1.21	0.50	11.43	0.29	29.81	0.76	0.00	99.63	0.81	0.17	0.01	enstatite
310.90a_5_5	310.75	55.26	0.14	1.19	0.50	11.41	0.26	29.68	0.99	0.01	99.44	0.80	0.17	0.03	enstatite
310.90a_6_2	310.75	55.12	0.15	1.37	0.42	10.48	0.24	28.87	2.52	0.02	99.19	0.79	0.16	0.05	enstatite
310.90a_6_5	310.75	55.52	0.15	1.27	0.47	11.07	0.28	29.64	1.37	0.01	99.78	0.81	0.17	0.03	enstatite
310.90a_6_6	310.75	55.36	0.16	1.19	0.48	10.80	0.29	28.77	2.25	0.03	99.32	0.79	0.17	0.04	enstatite
311.55_5_1	311.56	54.77	0.08	1.15	0.16	12.35	0.18	30.65	0.71	0.00	100.05	0.84	0.15	0.01	enstatite
311.55_5_2	311.56	54.03	0.14	1.47	0.32	12.18	0.17	29.18	1.68	0.00	99.17	0.81	0.16	0.03	enstatite
311.55_5_3	311.56	54.53	0.09	1.21	0.29	12.39	0.14	29.94	0.89	0.00	99.48	0.82	0.16	0.02	enstatite
311.55_5_4	311.56	54.21	0.13	1.30	0.22	12.40	0.18	29.86	1.02	0.00	99.32	0.82	0.16	0.02	enstatite
311.55_5_5	311.56	54.88	0.07	1.30	0.26	12.31	0.18	30.69	0.32	0.00	100.01	0.84	0.16	0.01	enstatite
311.55_5_6	311.56	54.75	0.13	1.47	0.33	12.07	0.19	29.83	1.40	0.03	100.20	0.81	0.16	0.03	enstatite
311.55_5_7	311.56	54.04	0.10	1.37	0.28	12.31	0.14	29.42	0.90	0.01	98.57	0.81	0.17	0.02	enstatite
311.55_3_1	311.56	54.46	0.21	1.51	0.38	12.84	0.19	29.47	1.02	0.05	100.13	0.81	0.17	0.02	enstatite
311.55_3_2	311.56	53.25	0.19	1.55	0.29	12.06	0.20	28.79	0.99	0.01	97.33	0.81	0.17	0.02	enstatite
311.55_3_3	311.56	53.83	0.18	1.59	0.28	12.31	0.16	29.15	0.77	0.04	98.31	0.81	0.17	0.02	enstatite
311.55_3_4	311.56	54.08	0.17	1.22	0.22	12.60	0.18	29.39	0.73	0.00	98.59	0.81	0.17	0.01	enstatite
311.55_3_5	311.56	54.65	0.13	1.32	0.24	12.23	0.20	29.76	1.04	0.00	99.57	0.81	0.17	0.02	enstatite
311.55_3_6	311.56	54.51	0.17	1.33	0.24	12.24	0.12	29.41	1.27	0.00	99.29	0.81	0.17	0.02	enstatite
311.55_3_7	311.56	54.39	0.15	1.47	0.25	12.68	0.24	29.73	0.72	0.00	99.63	0.82	0.17	0.01	enstatite
311.55_1_1	311.56	53.89	0.27	1.62	0.38	12.19	0.16	28.77	1.73	0.07	99.08	0.80	0.17	0.03	enstatite
311.55_1_2	311.56	54.54	0.20	1.53	0.38	12.20	0.18	29.60	0.98	0.00	99.61	0.81	0.17	0.02	enstatite
311.55_1_3	311.56	54.22	0.20	1.57	0.42	11.90	0.15	28.52	2.29	0.01	99.28	0.79	0.17	0.05	enstatite
311.55_1_4	311.56	54.42	0.21	1.61	0.36	11.84	0.16	28.98	2.27	0.00	99.85	0.80	0.16	0.04	enstatite
311.55_1_5	311.56	54.47	0.14	1.62	0.42	12.02	0.18	29.09	1.53	0.01	99.48	0.80	0.17	0.03	enstatite
311.55_1_6	311.56	54.35	0.17	1.64	0.52	11.74	0.16	29.02	1.92	0.06	99.58	0.80	0.16	0.04	enstatite
311.55_1_7	311.56	54.24	0.09	1.69	0.49	11.85	0.16	29.18	1.82	0.03	99.55	0.81	0.16	0.04	enstatite
311.55_1_8	311.56	54.41	0.15	1.69	0.50	11.98	0.16	29.08	2.00	0.00	99.97	0.80	0.16	0.04	enstatite
311.55_1_9	311.56	54.49	0.12	1.53	0.33	12.06	0.19	29.24	1.86	0.00	99.82	0.80	0.16	0.04	enstatite
311.55_1_10	311.56	54.45	0.17	1.62	0.39	12.28	0.17	29.43	1.59	0.01	100.11	0.81	0.16	0.03	enstatite
311.55_1_11	311.56	54.11	0.28	1.46	0.48	12.46	0.24	29.07	1.46	0.06	99.62	0.81	0.16	0.03	enstatite
311.55_1_12	311.56	54.38	0.26	1.64	0.41	12.11	0.18	29.21	1.58	0.09	99.86	0.81	0.16	0.03	enstatite
311.55_2_2	311.56	54.43	0.15	1.43	0.25	12.32	0.19	29.50	1.41	0.00	99.68	0.81	0.16	0.03	enstatite

311.55_2_3	311.56	54.39	0.26	1.53	0.38	12.30	0.14	29.04	1.96	0.05	100.05	0.80	0.16	0.04	enstatite
311.55_2_4	311.56	54.58	0.12	1.29	0.13	12.15	0.18	29.81	1.43	0.00	99.69	0.82	0.16	0.03	enstatite
311.55_2_5	311.56	54.28	0.13	2.18	0.33	12.80	0.20	28.83	0.86	0.07	99.68	0.80	0.18	0.02	enstatite
311.55_2_6	311.56	54.13	0.21	1.56	0.38	12.35	0.23	29.30	1.53	0.00	99.69	0.81	0.16	0.03	enstatite
313.25_4_1	313.21	53.45	0.10	1.32	N/A	12.08	0.24	29.67	0.65	0.00	97.51	0.83	0.16	0.01	enstatite
313.25_4_1	313.21	55.12	0.10	1.44	N/A	11.53	0.26	29.17	2.83	0.09	100.54	0.80	0.15	0.06	pigeonite
313.25_4_1	313.21	53.59	0.07	1.38	N/A	12.29	0.25	29.55	0.70	0.01	97.84	0.83	0.16	0.01	enstatite
313.25_4_2	313.21	53.22	0.17	1.53	N/A	11.66	0.25	28.28	2.59	0.00	97.70	0.79	0.15	0.05	pigeonite
313.25_4_2	313.21	54.64	0.20	1.72	N/A	11.24	0.24	28.82	3.10	0.09	100.05	0.79	0.15	0.06	pigeonite
313.25_4_2	313.21	52.17	0.36	1.52	N/A	12.84	0.32	28.07	1.69	0.04	97.01	0.80	0.16	0.03	enstatite
313.25_6_1	313.21	53.76	0.18	1.43	N/A	12.11	0.30	28.35	2.22	0.07	98.42	0.79	0.16	0.04	enstatite
313.25_6_1	313.21	54.54	0.20	1.55	N/A	12.97	0.20	29.71	0.64	0.00	99.81	0.81	0.18	0.01	enstatite
313.25_6_1	313.21	56.36	0.14	1.48	N/A	13.34	0.25	30.44	0.91	0.00	102.92	0.81	0.18	0.02	enstatite
313.25_6_1	313.21	54.47	0.13	1.46	N/A	11.80	0.30	28.29	3.17	0.06	99.68	0.78	0.16	0.06	pigeonite
313.25_7_1	313.21	54.93	0.20	1.59	N/A	13.07	0.29	29.25	0.69	0.09	100.11	0.80	0.19	0.01	enstatite
313.25_7_1	313.21	55.16	0.07	1.59	N/A	12.88	0.28	29.49	1.21	0.08	100.76	0.80	0.17	0.02	enstatite
313.25_7_1	313.21	55.72	0.10	1.69	N/A	13.06	0.29	30.13	0.84	0.00	101.83	0.81	0.18	0.02	enstatite
313.25_7_1	313.21	55.16	0.17	1.67	N/A	12.86	0.23	29.86	0.74	0.03	100.72	0.81	0.18	0.01	enstatite
313.25_7_1	313.21	53.85	0.19	1.51	N/A	12.45	0.26	29.20	1.39	0.02	98.87	0.81	0.16	0.03	enstatite
313.25_5_1	313.21	53.61	0.17	1.63	N/A	12.56	0.24	29.04	1.08	0.03	98.36	0.81	0.17	0.02	enstatite
313.25_5_1	313.21	55.29	0.14	1.62	N/A	12.50	0.28	29.49	2.05	0.04	101.41	0.80	0.16	0.04	enstatite
313.25_5_1	313.21	55.44	0.11	1.79	N/A	12.96	0.24	30.09	0.72	0.12	101.47	0.82	0.17	0.01	enstatite
313.25_5_1	313.21	55.19	0.09	1.81	N/A	12.59	0.32	29.95	1.04	0.05	101.04	0.81	0.16	0.02	enstatite
313.25_3_1	313.21	54.43	0.19	1.24	N/A	12.64	0.25	29.49	1.12	0.01	99.37	0.81	0.17	0.02	enstatite
313.25_3_1	313.21	54.23	0.16	1.69	N/A	12.12	0.29	28.18	2.75	0.12	99.54	0.78	0.16	0.05	pigeonite
313.25_3_1	313.21	55.44	0.08	1.48	N/A	12.55	0.29	29.97	0.97	0.05	100.83	0.81	0.17	0.02	enstatite
313.25_3_1	313.21	54.91	0.09	1.71	N/A	12.98	0.25	29.76	0.58	0.01	100.29	0.81	0.18	0.01	enstatite
313.25_2_1	313.21	55.01	0.11	2.33	N/A	13.30	0.27	29.36	0.93	0.02	101.33	0.80	0.18	0.02	enstatite
313.25_2_1	313.21	54.62	0.14	2.39	N/A	12.43	0.29	29.48	0.65	0.05	100.05	0.81	0.18	0.01	enstatite
313.25_2_1	313.21	55.60	0.21	2.64	N/A	12.78	0.24	29.45	1.56	0.00	102.48	0.79	0.18	0.03	enstatite
313.25_2_1	313.21	56.11	0.14	2.51	N/A	12.90	0.30	30.16	0.85	0.00	102.97	0.80	0.18	0.02	enstatite
313.25_2_1	313.21	55.83	0.23	2.69	N/A	12.26	0.32	29.27	2.23	0.02	102.85	0.78	0.17	0.04	enstatite
313.25_1_1	313.21	53.15	0.13	1.77	N/A	11.92	0.26	28.56	1.70	0.01	97.50	0.80	0.16	0.03	enstatite
313.25_1_1	313.21	54.30	0.16	1.69	N/A	12.32	0.23	29.16	0.87	0.00	98.73	0.80	0.18	0.02	enstatite
313.25_1_1	313.21	54.99	0.23	1.85	N/A	12.22	0.22	28.95	2.39	0.08	100.93	0.79	0.16	0.05	enstatite
313.25_1_1	313.21	56.55	0.12	1.26	N/A	12.85	0.28	30.88	0.43	0.09	102.46	0.82	0.17	0.01	enstatite
314.10b_1_2	314.12	55.10	0.15	1.38	0.39	12.27	0.30	29.47	0.62	0.00	99.67	0.80	0.19	0.01	enstatite
314.10b_1_7	314.12	54.72	0.18	1.11	0.36	12.39	0.28	28.71	1.30	0.00	99.05	0.79	0.19	0.03	enstatite
314.10b_2_3	314.12	55.52	0.15	1.20	0.44	11.44	0.28	29.05	2.02	0.03	100.13	0.79	0.17	0.04	enstatite
314.10b_3_1	314.12	54.80	0.23	1.15	0.36	12.69	0.29	28.61	0.99	0.01	99.12	0.79	0.19	0.02	enstatite
314.10b_3_2	314.12	55.40	0.18	0.78	0.21	12.67	0.34	29.04	0.84	0.01	99.47	0.80	0.19	0.01	enstatite
314.10b_5_1	314.12	55.24	0.35	1.08	0.32	12.57	0.32	28.99	0.57	0.00	99.44	0.80	0.19	0.01	enstatite
314.10b_5_2	314.12	55.37	0.23	0.85	0.27	12.60	0.32	29.09	0.64	0.00	99.35	0.79	0.19	0.01	enstatite
314.10b_5_3	314.12	55.71	0.10	0.66	0.19	13.02	0.26	29.25	0.53	0.00	99.72	0.79	0.20	0.01	enstatite
314.10b_5_4	314.12	55.49	0.13	0.66	0.21	12.70	0.32	29.11	0.80	0.00	99.42	0.79	0.19	0.02	enstatite

Sample Descriptions

Sample 314.10b (FW Norite)

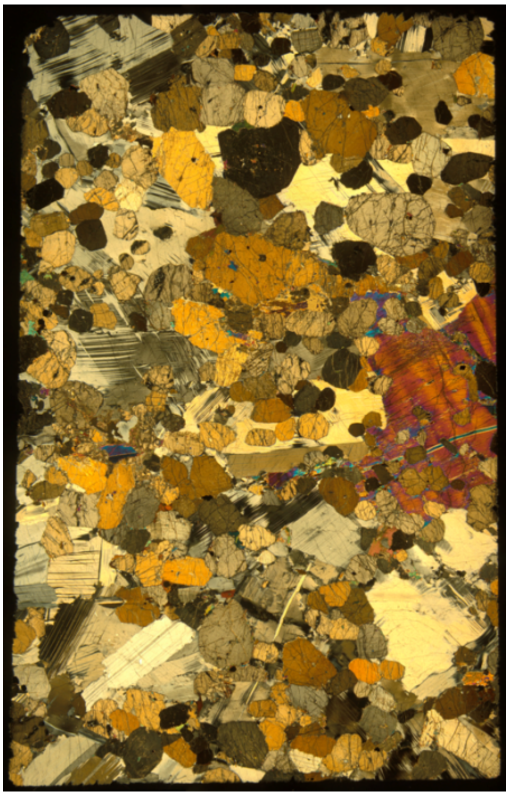

Figure 1: Photograph of thin section 314.10b under a transmitted light microscope. Cross polarized light. Size of 3.3 cm by 2.2 cm. Thickness of thin section 35–40 µm.

This sample is characterised by an inequigranular cumulate texture (Figure 1). Orthopyroxene is the cumulate phase, while plagioclase and clinopyroxene form the intercumulus phases. The cumulate can be termed orthocumulate, as the interstitial phases exceed 25 % of the total thin section area. In some places a poikilitic texture is formed by subhedral to anhedral orthopyroxenes of varying grain sizes (fine to medium grained), which are enclosed by medium to coarse grained anhedral plagioclase oikocrysts (Figure 2). In the lower left corner of the thin section, also plagioclase occurs as cumulus phase. A single coarse grained clinopyroxene oikocryst occurs at the mid right edge of the thin section. According to the mineral abundances (orthopyroxene ~50%, plagioclase ~40%, and clino-pyroxene < 10%) this rock type can be classified as norite.

Plagioclase grains are exclusively anhedral. Grain sizes vary between 2 mm and 6 mm. The maximum interference colour is white with a yellow tint of 1st order. Undulose extinction is a common feature. Wedge-shaped deformation twins are abundant, while polysynthetic twins occur less frequent. Some plagioclase grains are altered to a fine grained material that probably consists of a mixture of secondary, hydrous minerals as epidote (Ep), chlorite (Chl) and amphibole (Am) (Figure 3).

Orthopyroxene grains are an- to subhedral. Grain sizes vary from 1 mm to 7 mm. The maximum interference colour is orange of 1st order. Orthopyroxene grains are recognised by a medium relief and abundant fractures that do not follow any obvious mineralogical orientation. If crystal edges are well developed, which occurs in some of the subhedral grains, straight extinction is a characteristic feature. Some opaque minerals, probably chromite grains, occur as inclusions within orthopyroxene grains.

A single clinopyroxene oikocryst that is 1.2 cm in length appears on the mid-right side of the thin section. It is anhedral and encloses orthopyroxene grains. The maximum interference colour is orange of 2nd order. Other characteristics are a high relief and oblique extinction to cleavage.

Accessory phases are described in the following. Amphibole, recognised by its light green colour, maximum interference colour (blue-green of 2nd order) and characteristic cleavage intersection angles of 124°, is rare and occurs preferentially in contact with orthopyroxene grains. Anhedral biotite grains (up to 2 mm in length), indicated by pleochroism from orange to brown, occur in contact with orthopyroxene grains or enclose opaque minerals, probably chromite. These opaque phases are eu- to subhedral and are randomly distributed within the thin section, but mostly occur as < 1 mm sized inclusions within orthopyroxene grains.

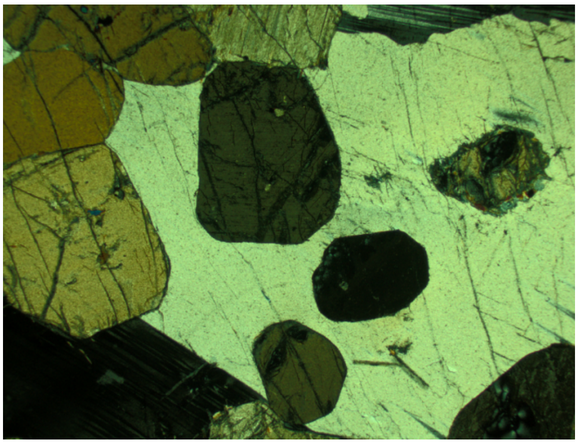

Figure 2: Photomicrograph of thin section 314.10b. Cross polarized light, magnification 25x. Pl oikocryst enclosing Opx grains. Length of lower image edge: 4.5 mm.

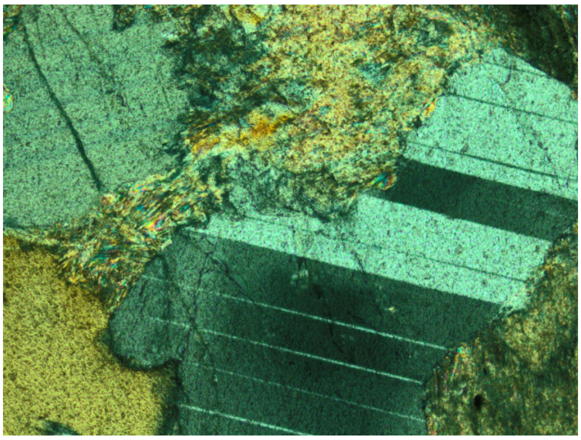

Figure 3: Photomicrograph of thin section 314.10b. Cross polarized light, magnification 100x. Altered Pl grain. Length of lower image edge: 1.2 mm.

Sample 313.25 (Lower Pegmatoid)

Figure 4: Photograph of thin section 313.25 under a transmitted light microscope. Cross polarized light. Size of 3.3 cm by 2 cm. Thickness of thin section 35 - 40 µm.

The texture of this sample is almost equigranular, with orthopyroxene grains (2 mm to 5 mm in length) being a little coarser than plagioclase grains (1 mm to 3 mm in length) (Figure 4). An equilibrium texture, which is generated by grain boundary angles of 120°, is repeatedly visible (Figure 5). Orthopyroxene and plagioclase both appear as cumulus phases. Fine grained plagioclase also forms inclusions in orthopyroxene. According to the mineral abundances (plagioclase ~40%, orthopyroxene ~55%, and chromite ~5%) this rock type is classified as norite. In the lower right corner of the thin section orthopyroxene grains are altered to fine grained greenish material that is probably composed of serpentine. Similarly, plagioclase shows fine grained reaction rims, which are presumably composed of epidote (Figure 6).

Plagioclase occurs equally frequent as tabular subhedral and granular anhedral grains. Wedge-shaped deformation twins are common, while polysynthetic twinning is rare. Maximum interference colour is a light orange of 1st order. Anomalous interference colours of light brown to dark blue appear in some places.

Orthopyroxene is the most abundant mineral phase in this thin section. Orthopyroxene crystals are exclusively anhedral and often reveal embayed grain boundaries. Characteristic 120° angles between the grain boundaries of orthopyroxene and plagioclase, which represent equilibrium textures, are rare (Figure 5). Orthopyroxene is identified by its medium relief and abundant fractures that do not follow any obvious mineralogical orientation. The maximum interference colour is orange of 1st order.

Accessory minerals are described in the following. Only a few anhedral clinopyroxene grains are present in the thin section. These are characterized by oblique extinction to cleavage and a medium relief. Grain size is about 3 mm. Clinopyroxene also shows inclusions of plagioclase. Anhedral to subhedral chromite grains are randomly distributed within the thin section and occur both between plagioclase and orthopyroxene grains and as inclusions within orthopyroxenes. Grain size varies around 0.5 mm. Biotite is very rare and occurs fine grained (*ca.* 1 mm in length) in association with orthopyroxene.

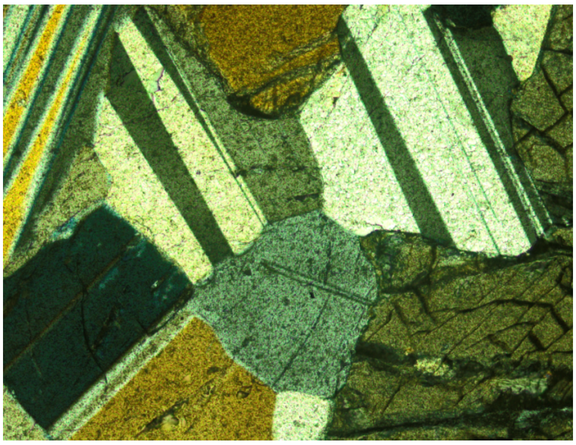

Figure 5: Photomicrograph of thin section 313.25. Cross polarized light, magnification 100x. Length of lower image edge: 1.2 mm. Characteristic 120° angles between grain boundaries of individual grains of Pl and Opx indicate an equilibrated texture.

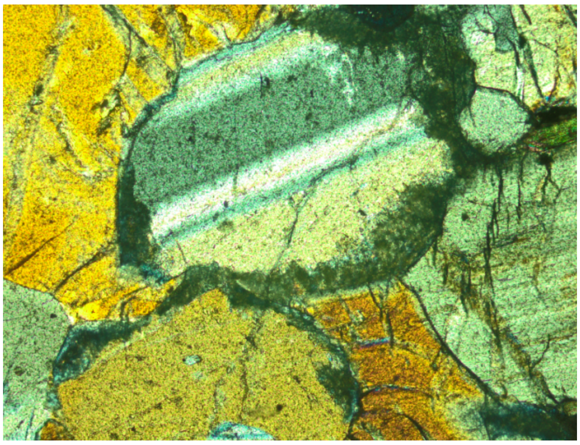

Figure 6: Photomicrograph of thin section 313.25. Cross polarized light, magnification 100×. Length of lower image edge: 1.2 mm. Fine grained reaction rim around a plagioclase grain.

Sample 311.55 (Lower Pegmatoid)

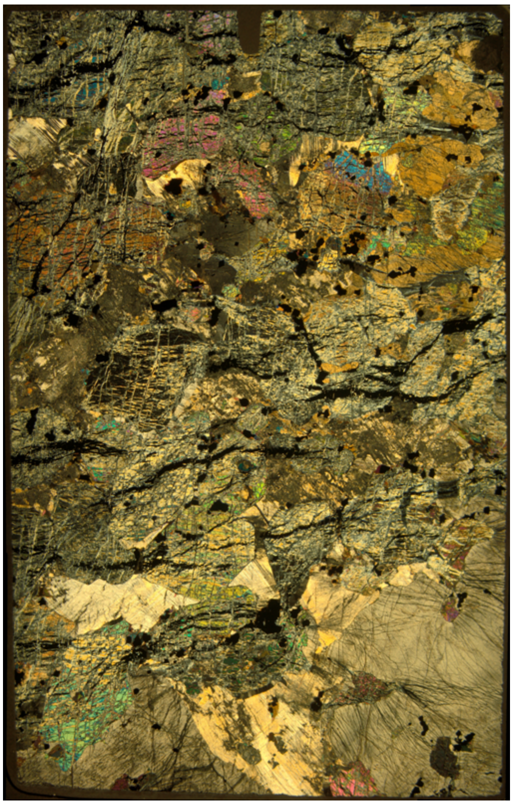

Figure 7: Photograph of thin section 311.55 under a transmitted light microscope. Cross polarized light. Size of 3.6 cm by 2.2 cm. Thickness of thin section 35–40 μm.

The cumulate texture in this thin section is inequigranular with coarse olivine and coarse to very coarse orthopyroxene (cumulus phase). Plagioclase occurs as coarse to medium grained intercumulus phase (Figure 7). It can be termed mesocumulate. According to the mineral abundances (olivine ~55%, orthopyroxene ~20%, plagioclase ~20% and chromite ~5%) this sample is classified as olivine melanorite. Olivine and orthopyroxene are heavily pervaded by fractures. While plagioclase crystals are virtually fracture free, fractures in olivine are subvertically oriented and fractures in orthopyroxenes point towards olivine inclusions. There are ample alteration features in this thin section. Olivine grains are heavily serpentinised. This is indicated by expansion cracks, which are filled with black iron oxides (probably magnetite) that are enveloped by green very fine grained material (serpentine) (Figure 8). In contact with plagioclase a reaction rim (kelyphite) is developed around olivine grains. In addition, some plagioclase grains are altered to a greenish fine grained material that probably comprises a mixture of secondary, hydrous minerals as epidote, chlorite or amphibole.

Plagioclases are invariably anhedral (Figure 9) with varying grain sizes of 3 mm to 8 mm. Wedge-shaped deformation twins and undulose extinction are ubiquitous. Anomalous interference colours and inclusions of olivine, orthopyroxene, opaque phases and biotite are common.

Olivine grains are mostly anhedral, but some are subhedral. A single grain is euhedral. Grain size is constant around 8 mm. Olivine grains are recognised by their high relief, equant crystal shape and maximum interference colour (pink of 3rd order).

Orthopyroxene grains are only minor constituents and appear predominantly in the lower third of the thin section. They are anhedral, up to 1.5 cm in diameter and characterized by a medium relief (lower than olivine). Maximum interference colours are orange/brown of 1st order. Olivine and opaque phases form inclusions.

Accessory minerals are described in the following. Apart from the iron oxides that fill the expansion cracks within olivine grains, other opaque phases (probably chromite) are abundant in this thin section. They are characterised by their mostly granular subhedral grain shape. They preferentially occur at grain boundaries, but also within olivine or orthopyroxene grains. Grain sizes are variable, but <1 mm. Orange-coloured biotite is extremely rare and appears in association with the greenish fine-grained material that seems to be an alteration product of plagioclase.

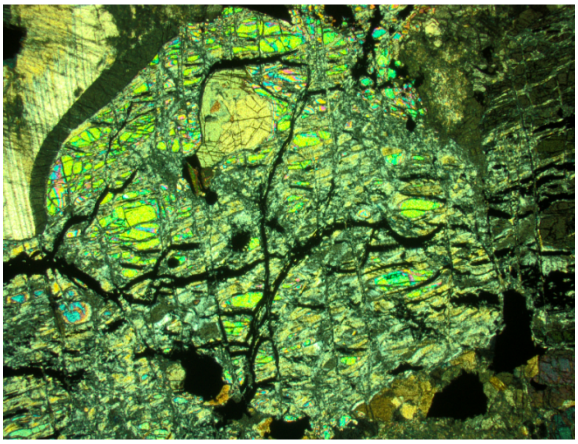

Figure 8: Photomicrograph of thin section 311.55. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Serpentinised Ol grain with black filled expansion cracks and reaction rim (upper left corner).

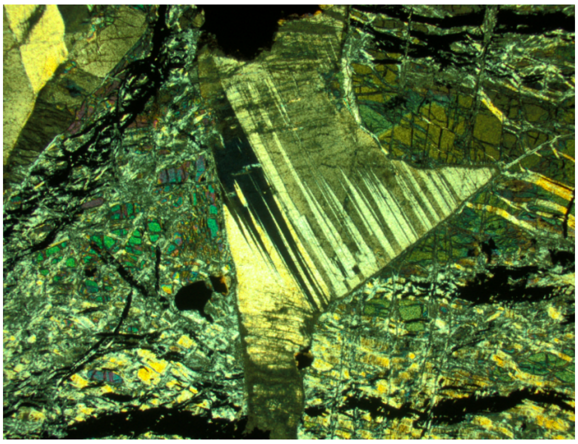

Figure 9: Photomicrograph of thin section 311.55. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Anhedral Pl grain with deformation twins, enclosed by Ol grains.

Sample 310.90a (Lower Split/Main Seam)

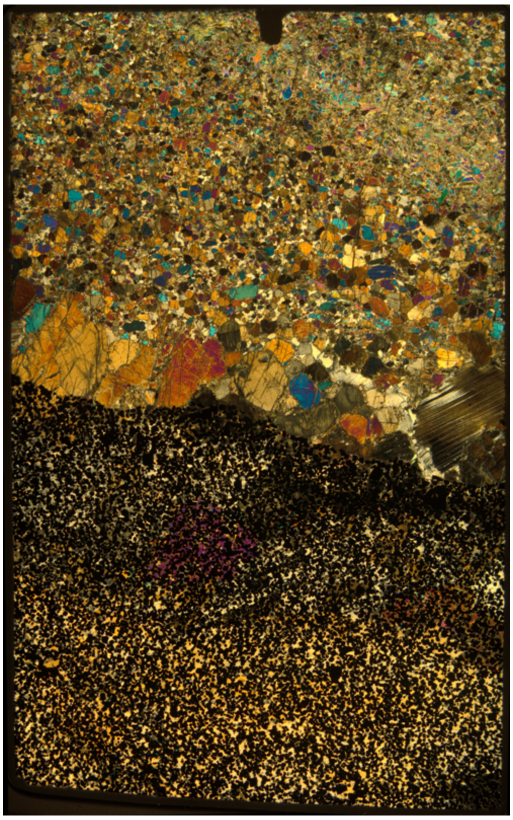

Figure 10: Photograph of thin section 310.90a under a transmitted light microscope. Cross polarized light. Size of 3.2 cm by 2 cm. Thickness of thin section 35–40 μm.

This thin section was taken from the transition zone of two lithological units. The upper half covers the Lower Split, while the lower half covers the Main Seam. With the exception of the coarse-grained (up to 6 mm) contact zone to the Main Seam, the Lower Split in this thin section is characterized by an equigranular cumulate texture, where fine grained (0.5 mm to 1 mm) orthopyroxene forms the cumulus phases, while fine grained plagioclase of same grain size represents the intercumulus phase (Figure 10). The cumulate is termed mesocumulate, since cumulus grains are in contact and intercumulus grains do not exceed 25 % of total volume. According to the mineral abundances (orthopyroxene ~70%, plagioclase ~25%) the Lower Split is classified as melanorite. The crystal shape of the fine grained material is constantly equant. Opaque phases are totally absent. Two distinctive and some minor subvertical fractures cut this fine grained mineral assemblage. At the mid top the thin section is pervaded at an angle of *ca.* 30° by a fine grained (0.5 mm to 1 mm) vein of *ca.* 5 mm thickness, which proceeds to the right edge of the thin section. It is composed of fibrous minerals that are not preferentially oriented. The maximum interference colour is pink of 3rd order. The vein probably consists of epidote and/or muscovite.

The coarse grained lower rim of the Lower Split consists predominantly of orthopyroxene, with minor clinopyroxene and plagioclase that occurs both as intercumulus grains and as a single coarse cumulus grain at the mid-right side of the thin section. The contact zone between the two subunits of the UG2 is drawn on the basis of the upward disappearance of chromite grains. It is apparent that, in contrast, single grains of silicate phases, as plagioclase and orthopyroxene cross this boundary and maintain their crystallographic orientation (Figure 11).

The Main Seam is characterized by its poikilitic texture (Figure 12). Chromite grains are enclosed in coarse (up to 6 mm) silicate grains that are dominated by plagioclase although subordinate orthopyroxene is also observed. Coarser chromite grains (~0.5 mm) are preferentially accumulated near the transition of the two lithological units. According to the mineral abundances (chromite ~60%, plagioclase < 35%, Opx < 10%) this rock type is classified as chromitite.

Plagioclase grains in the lower split are granular, anhedral, of fine grain-size (0.5 mm to 1 mm) and without exception intercumulus phases. The maximum interference colour is white with a yellow tint of 1st order. Twinning is limited to deformation twinning. One exceptional grain occurs within the lower coarse grained rim of the lower split at the right edge of thin section. The length is *ca.* 7 mm. It is subhedral, tabular and shows deformation twins. In the Main Seam plagioclase forms coarse anhedral oikocrysts (up to 6 mm in diameter) with common undulose extinction. Maximum interference colour is a bright yellow of 1st order.

In the Lower Split, orthopyroxene grains are subhedral to anhedral, granular and fine grained (0.5 mm to 1 mm), except for the coarse rim, where grain sizes reach 6 mm in length. Most of the grains are well rounded. Orthopyroxene is characterised by its higher relief towards plagioclase, abundant fractures and a maximum interference colour (sky blue of 2nd order). In the Main Seam, only a few anhedral orthopyroxene oikocrysts (up to 6 mm in length) occur. Maximum interference colour (pink of 1st order) and a higher relief towards plagioclase are characteristic features.

Chromite grains are randomly disseminated in the Main Seam. They are black, granular and subhedral, subrounded to rounded and display a bimodal distribution with abundant grain sizes of 80 µm and 0.5 mm. A few reach 0.8 mm in diameter. Usually individual grains are in contact. Sulphide inclusions are very rare.

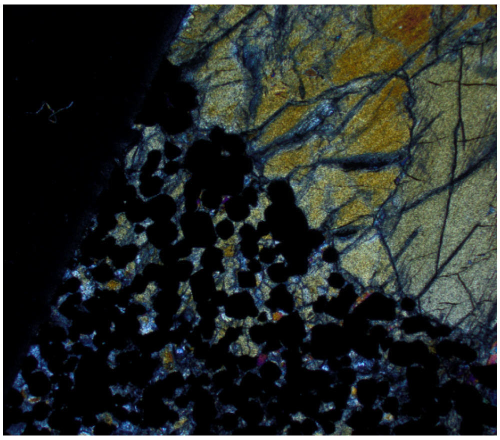

Figure 11: Photomicrograph of thin section 310.90a. Cross polarized light, magnification 25×. Length of lower image edge: 4 mm. Opx grain crossing the Lower Split/Main Seam boundary.

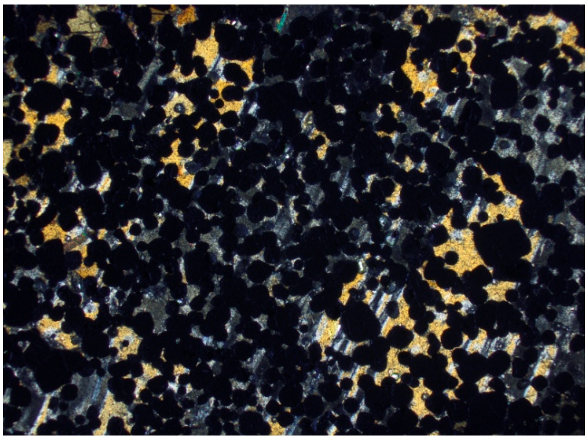

Figure 12: Photomicrograph of thin section 310.90a. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Poikilitic texture: Chr grains are enclosed in Pl oikocrysts.

Sample 310.00b (Upper Split)

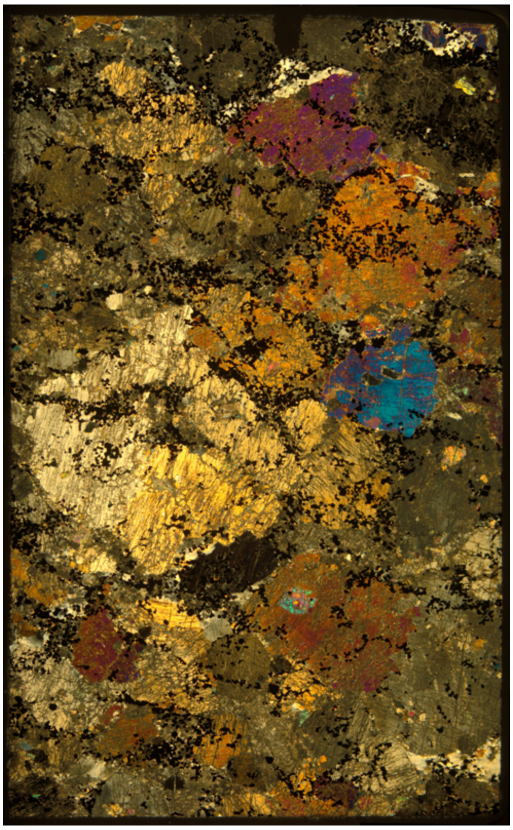

Figure 13: Photograph of thin section 310.00b under a transmitted light microscope. Cross polarized light. Size of 3.1 cm by 2 cm. Thickness of thin section 35–40 µm.

This sample has an equigranular cumulate texture of coarse grain sizes (5 mm to 1 cm) (Figure 13). As the rock forming minerals in this thin section are mostly orthopyroxene grains, which are in contact with each other, and minor plagioclase, this assemblage shows an adcumulate texture. Very fine grained chromite (*ca.* 0.15 mm in diameter) preferentially occurs along grain boundaries (Figure 14), but also within orthopyroxene and plagioclase grains. The chromite distribution appears like a meshed network. According to the mineral abundances (orthopyroxene ~75%, chromite ~20% and plagioclase ~5%) this rock type is classified as chromite pyroxenite. Some orthopyroxene grains are altered to very fine greenish material along fractures and grain boundaries. This alteration coincides with the presence of the chromite grains in many places. In some orthopyroxene grains a second alteration feature is visible. Along fractures very fine fibrous minerals (probably micas) with various interference colours of 3rd order are present. Also plagioclase is altered to a fine grained greenish matrix with low birefringence (Figure 15).

Plagioclase is only accessory in this sample and occurs as anhedral interstitial grains that are mostly elongate and up to 6 mm in length. Undulose extinction is common. Grain boundaries with neighbouring minerals are sharp. Twinning is more or less absent. The maximum interference colour is straw yellow of 1st order.

Orthopyroxene is the dominant mineral phase. Grains are brownish, anhedral, coarse (5 mm to 1 cm) and mostly granular with a medium relief. Maximum interference colour is sky blue of 2nd order. Fractures are ubiquitous.

Chromite is black, subhedral or rounded and reveals variable, but very fine grain sizes (0.1 mm up to 0.3 mm in diameter). However, most of the chromite grains are about 0.15 mm in diameter. Grain size distribution between chromite grains that occur along grain boundaries and chromite grains within rock forming minerals is random.

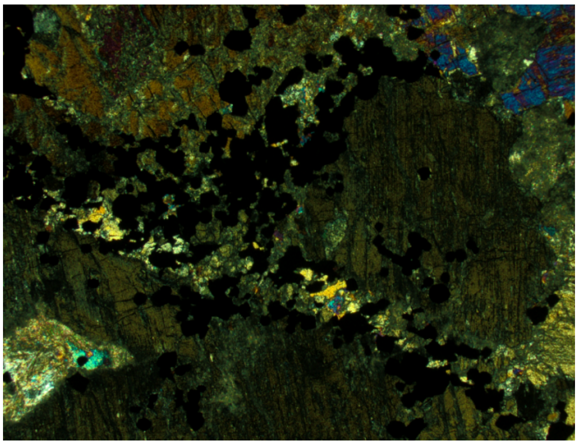

Figure 14: Photomicrograph of thin section 310.00b. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Chr grains occur preferentially along grain boundaries of Opx grains.

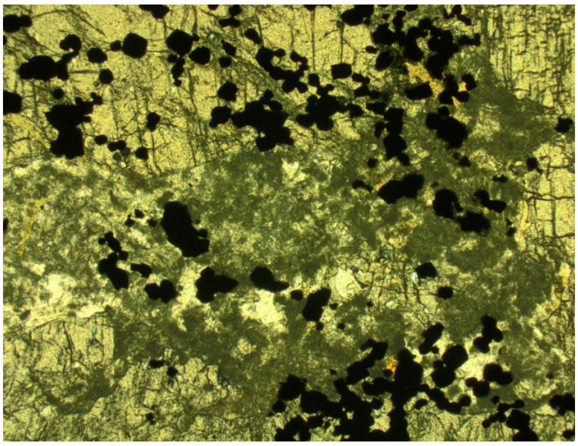

Figure 15: Photomicrograph of thin section 310.00b. Plane polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Streaks of greenish matrix within a Pl grain.

Sample 310.00a (Leader Seam)

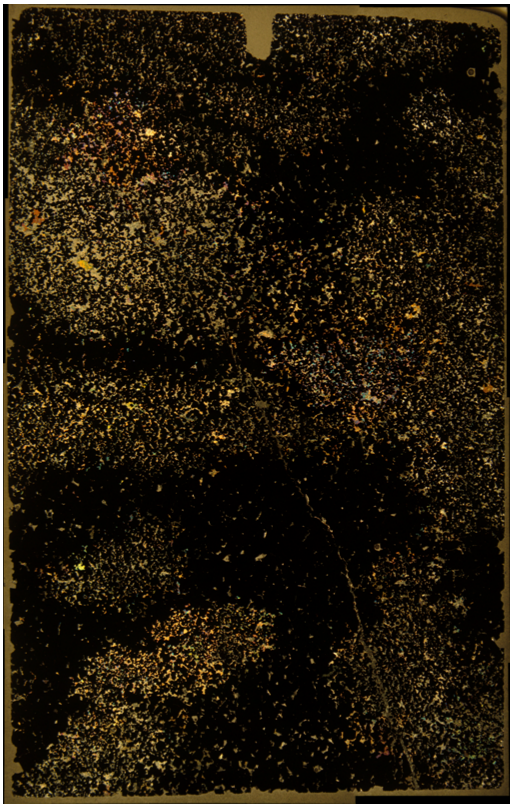

Figure 16: Photograph of thin section 310.00a under a transmitted light microscope. Cross polarized light. Size of 3.1 cm by 2 cm. Thickness of thin section 35 - 40 μm.

This sample is mainly composed of black chromite grains that show a bimodal grain size distribution of 0.1 mm and 0.7 mm (Figure 16). Almost, half of the thin section is covered by the coarse chromite fraction, which occurs as densely packed accumulations, where interstices are virtually absent (Figure 17). These accumulations are randomly distributed, but they are in connection with each other and form horizontally elongate vein-like or circular structures of cm scale.

The remaining parts of the thin section are composed of fine chromite grains, which are in contact, and mainly cryptocrystalline material that fills the interstices between these grains. This matrix is most likely an alteration product of coarse plagioclase, orthopyroxene and clinopyroxene because in places, areas of *ca.*7 mm in diameter show the same extinction. Plagioclase is the only silicate phase that could be clearly distinguished as individual grains (Figure 18). These plagioclase grains are anhedral and *ca.* 0.5 mm in length. The maximum interference colour is bright yellow of 1st order. According to the mineral abundances (chromite ~70%, cryptocrystalline matrix ~30%) this rock type is classified as chromitite. A subvertical fracture of *ca.* 0.5 mm thickness, which is filled with brownish fibrous mineral aggregates, cuts the thin section in the lower half.

The fine grained chromite fraction is subhedral, sub-angular to sub-rounded, while the coarse grained fraction is anhedral and sub-rounded to rounded.

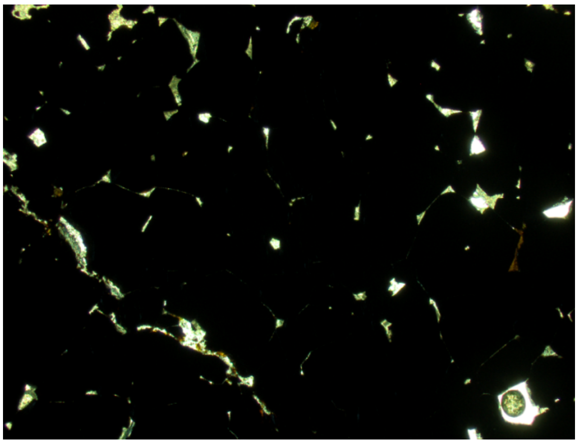

Figure 17: Photomicrograph of thin section 310.00a. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Densely packed, subrounded to rounded Chr grains.

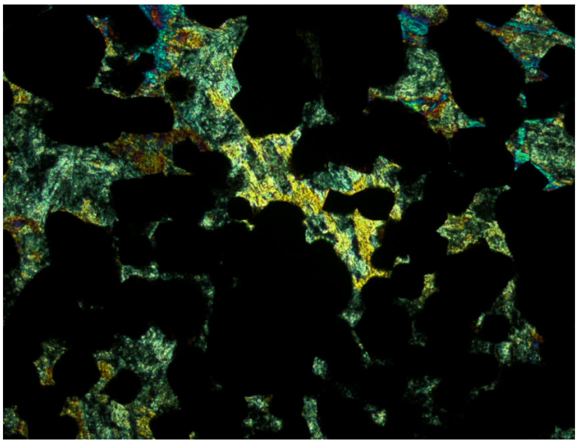

Figure 18: Photomicrograph of thin section 310.00a. Cross polarized light, magnification 100×. Length of lower image edge: 1.2 mm. Interstitial Pl grain in between sub-angular Chr grains.

Sample 309.75a (Upper Pegmatoid)

Figure 19: Photograph of thin section 309.75a under a transmitted light microscope. Cross polarised light. Size of 3.6 cm by 2.1 cm. Thickness of thin section 35–40 µm.

This sample has an equigranular texture of medium grain size (3 mm to 5 mm) (Figure 19). All mineral grains are anhedral and dominated by orthopyroxene and lesser olivine. Plagioclase is very rare and fills the interstices between the mafic mineral phases. Opaque phases are accessory, angular anhedral and randomly distributed over the thin section. Non continuous vertical fractures (<1 mm in thickness) are common.

Ample alteration features are present. Fine grained greenish material (serpentine and/or chlorite), which has partly replaced primary minerals such as olivine and pyroxene, intensely pervades the whole thin section. Moreover, two calcite grains (up to 5 mm in length) are present. Orthopyroxene is altered to amphibole. Olivine shows reaction rims in contact with plagioclase. According to the mineral abundances (orthopyroxene ~50%, olivine ~25%, clinopyroxene ~15%, plagioclase + opaque phases +calcite ~10%) this rock type is classified as plagioclase - bearing olivine pyroxenite, although, due to the intense influence of alteration this classification cannot be definite.

Orthopyroxene grains are brownish/orange, anhedral and coarser (5 mm in diameter) than other mineral phases in this thin section. A medium relief, straight extinction to cleavage and abundant fractures are characteristic. Maximum interference colour is purple of 1st order.

Olivine is the second most abundant mineral phase. It appears white with a yellow tint. Olivine grains are anhedral, heavily fractured and occur next to, or as inclusions within orthopyroxene grains (Figure 20). Maximum interference colour is lustrous green of 3rd order. Serpentinisation is common. Abundant fractures are filled with black iron oxides (most likely magnetite).

In the following, accessory phases are described. Plagioclase is only accessory and occurs as anhedral interstitial grains with grain sizes < 2 mm (Figure 21). Maximum interference colour is bright yellow of 1st order. Deformation twins are common. Plagioclase grains are covered with dark fine grained 'Schlieren', which complicate the identification of the plagioclases. Amphibole appears yellow/green with interference colours of 1st order within orthopyroxene grains. Embayed grain boundaries are common. Two anhedral calcite grains occur that reveal characteristic birefringence and deformation twinning. One of them reaches 0.5 cm in length.

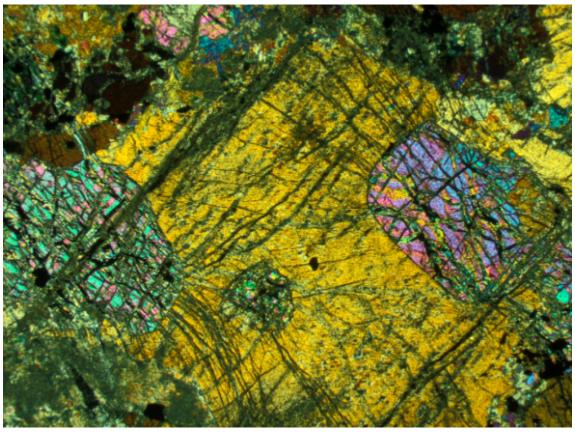

Figure 20: Photomicrograph of thin section 309.75a. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Ol inclusions in Opx.

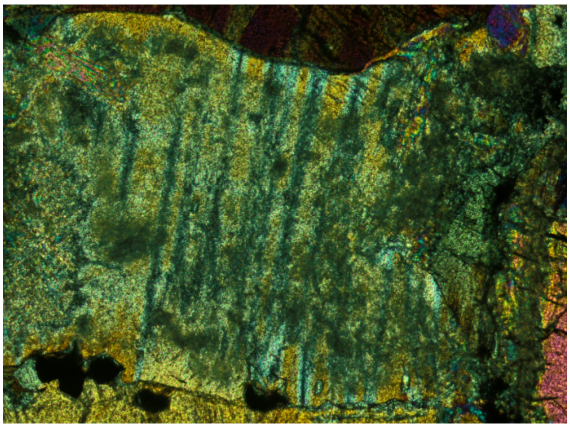

Figure 21: Photomicrograph of thin section 309.75a. Cross polarized light, magnification 100×. Length of lower image edge: 1.2 mm. Interstitial Pl grain with dark 'Schlieren'.

Sample 309.75b (Upper Pegmatoid)

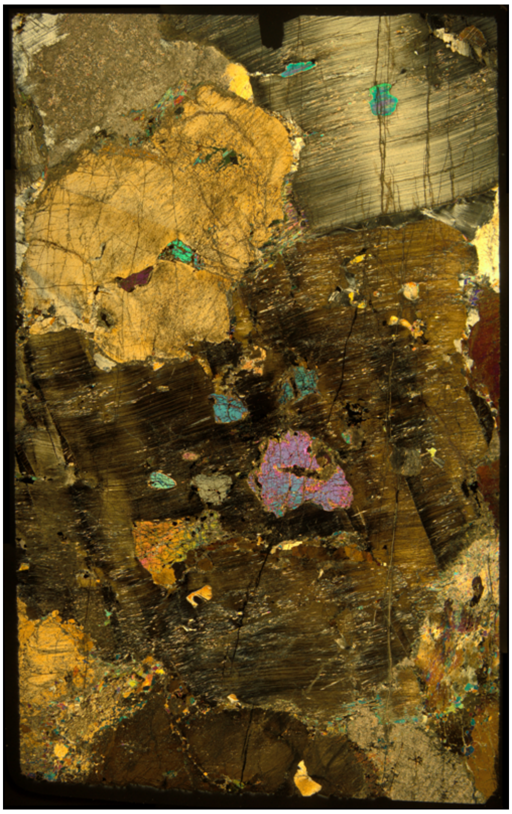

Figure 22: Photograph of thin section 309.75b under a transmitted light microscope. Cross polarised light. Size of 3.3 cm by 2.1 cm. Thickness of thin section 35 - 40 µm.

This sample is has an unequigranular texture that is formed by very coarse (up to 2.2 cm in diameter) orthopyroxene grains (Figure 22), which show inclusions of medium grained olivine (up to 0.5 cm in diameter) and plagioclase that appears with variable sizes in the interstices between the orthopyroxene grains (Figure 23). According to the mineral abundances (orthopyroxene ~80%, plagioclase ~15%, olivine ~5%), this rock type can be classified as olivine-bearing melanorite. Some features indicate that the primary mineral assemblage was influenced by alteration: Interstices are filled with muscovite, amphibole and quartz. In the upper left corner of the thin section plagioclase is altered to very fine grained material that probably consists of a mixture of secondary, hydrous minerals such as epidote, chlorite and amphibole (Figure 24). In the lower two corners of the thin section orthopyroxene is probably altered to a mixture of patchy and fibrous amphibole (Figure 25 and 26). Some vertical fractures (< 1 mm in thickness) cross the whole thin section, but are interrupted at interstitial plagioclase grains.

Orthopyroxene grains are dominant, anhedral and very coarse (up to 2.2 cm in diameter). They are recognised by their light orange colour, higher relief towards plagioclase and by their lower relief relative to olivine. Maximum interference colour is brown yellow of 1st order. Some grains show wavy twin lamellae and undulose extinction. Fractures are abundant and mostly vertical. In the coarsest orthopyroxene grain in the center deformation twins are visible. Inclusions of clinopyroxene (Figure 27), olivine and plagioclase are common within orthopyroxene.

Olivine occurs without exception as inclusions within orthopyroxene. It is recognised by its high relief, anhedral grain shape and maximum interference colours (pink of 3rd order). Fractures are very abundant. Serpentinisation is indicated by green fine grained 'Schlieren' and black granular opaque phases, probably iron oxides.

Plagioclase occurs as coarser interstitial grains (up to 1 cm in length), or as finer irregular shaped inclusions (*ca*. 2 mm in length) within orthopyroxene (Figure 28). In the upper left corner of the section a coarse plagioclase grain (of *ca.* 1 cm in diameter) has been intensely altered to fine grained material. Plagioclase grains are anhedral. Maximum interference colour is bright yellow of 1st order. Undulose extinction and deformation twins are common.

Clinopyroxene occurs only as anhedral rounded inclusions (up to 2 cm in diameter) and as exsolution along orthopyroxene lamellae. Maximum interference colour is light green of 2nd order. Opaque phases are mainly associated with olivine grains and thus probably represent magnetite.

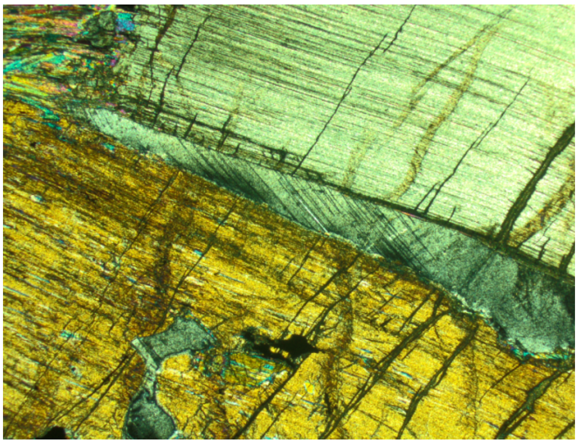

Figure 23: Photomicrograph of thin section 309.75b. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Elongate interstitial Pl grain between larger Opx grains.

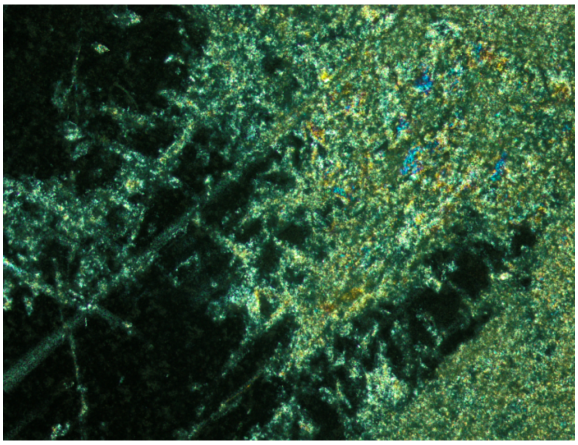

Figure 24: Photomicrograph of thin section 309.75b. Cross polarized light, magnification 100×. Length of lower image edge: 1.2 mm. Pl is altered to fine grained material.

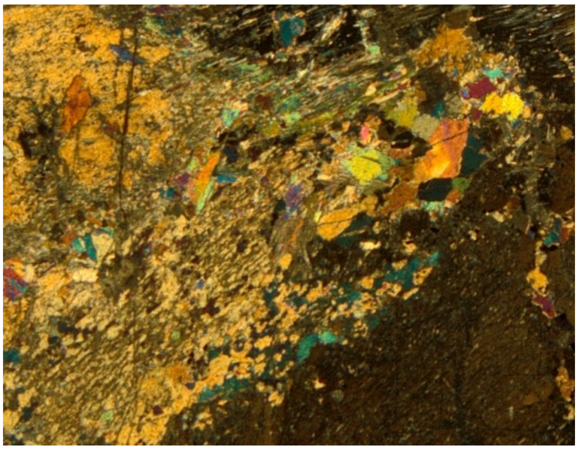

Figure 25: Photomicrograph of thin section 309.75a. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Mixture of patchy and fibrous Opx alteration products near Opx crystals.

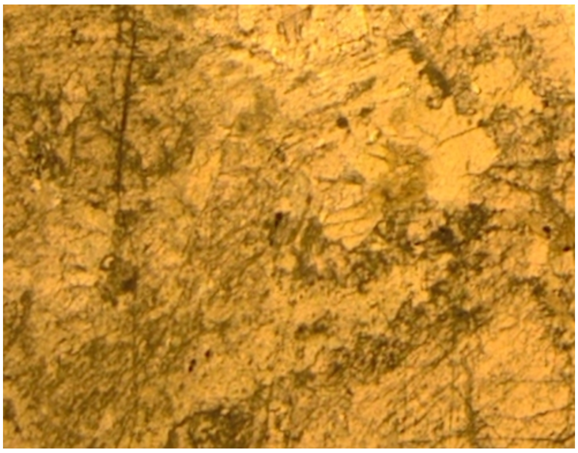

Figure 26: Photomicrograph of thin section 309.75a. Plane polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Mixture of patchy and fibrous Opx alteration products near Opx crystals.

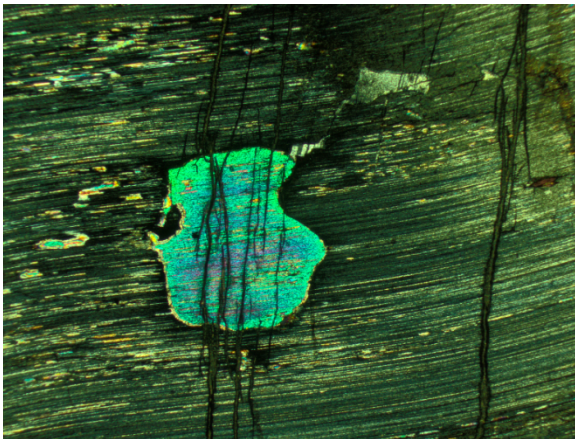

Figure 27: Photomicrograph of thin section 309.75a. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Cpx inclusion and Cpx exsolution along lamellae within Opx.

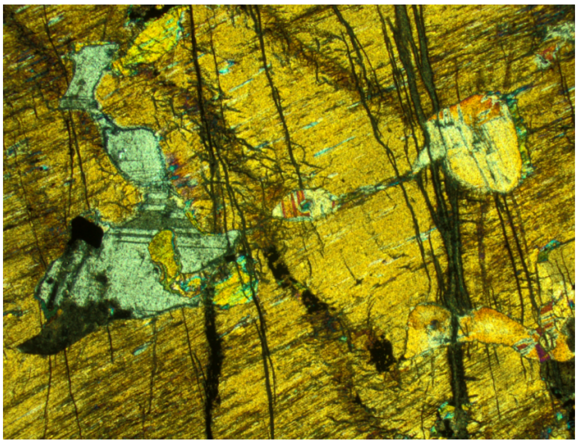

Figure 28: Photomicrograph of thin section 309.75b. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Irregular shaped Pl inclusion in Opx.

Sample 308.90 (Upper Distal)

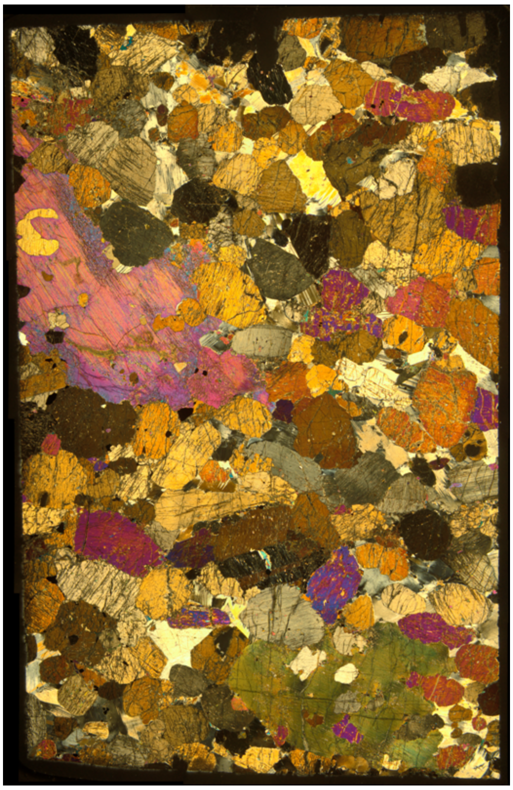

Figure 29: Photograph of thin section 308.90 under a transmitted light microscope. Cross polarised light. Size of 3.5 cm by 2.2 cm. Thickness of thin section 35–40 µm.

This sample has an inequigranular cumulate texture (Figure 29). It is dominated by medium grained anhedral to subhedral orthopyroxene (*ca.* 3 mm in diameter) as cumulus phase and anhedral interstitial plagioclase grains, along with coarse clinopyroxene oikocrysts (up to 1.3 cm in length) as intercumulus phases. Mineral grains are mainly granular. Only a few are elongate and sub-horizontally orientated. Opaque phases are rare and occur in association with pyroxene grains. No veins or fractures that cut multiple mineral grains are visible. Alteration features are virtually absent. According to the mineral abundances (orthopyroxene ~70%, plagioclase ~ 15%, clinopyroxene ~15%) this rock type is classified as gabbronorite.

Orthopyroxene is the dominant mineral phase. Grains are light orange to greenish, anhedral, mostly granular, but rarely elongate and mainly of medium size (0.3 mm to 0.8 mm in length). Maximum interference colour is indigo of 1st order. A higher relief towards plagioclase is characteristic. Fractures of statistical orientation and very fine inclusions are common. In a single elongate grain deformation twins are visible. Inclusion bands are bent in this grain. Orthopyroxene also occurs as 1 mm to 3 mm sized inclusions within clinopyroxene grains.

Plagioclase is the second most abundant mineral phase. Grains are anhedral, medium sized (2 mm to 5 mm in length) and appear as interstitial minerals (Figure 30). Grain shapes are irregular. Undulose extinction, anomalous interference colours (blue to brown) and wegde-shaped deformation twins are common. Fractures are almost absent. Maximum interference colour is bright yellow of 1st order. Plagioclase also forms inclusions within clinopyroxene grains (Figure 31).

Clinopyroxene is present as two coarse oikocrysts (up to 1.3 cm in length). Grains are greenish and can be distinguished from orthopyroxene through abundant exsolution lamellae and maximum interference colours (blue violet of 2nd order) (Figure 31).

In the following, accessory minerals are described. Amphibole is very rare and occurs as anhedral grains < 1 mm, in association with orthopyroxene. Amphibole is likely an alteration product of orthopyroxene. Characteristic cleavage angles of 124° are visible in one of the grains. Maximum interference colour is red of 2nd order. Opaque phases mainly appear in the lower left quarter of the thin section within, or at grain boundaries of pyroxene grains. Grain sizes are <1 mm. Only a few brown grains of biotite are present. They occur without exception at grain boundaries of orthopyroxene grains.

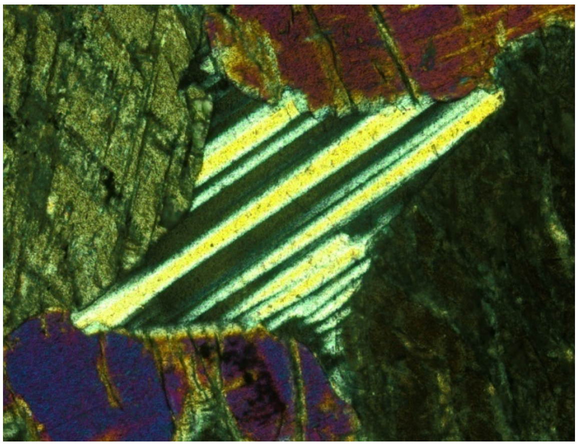

Figure 30: Photomicrograph of thin section 308.90. Cross polarized light, magnification 100×. Length of lower image edge: 1.2 mm. Intercumulus Pl in between Opx grains.

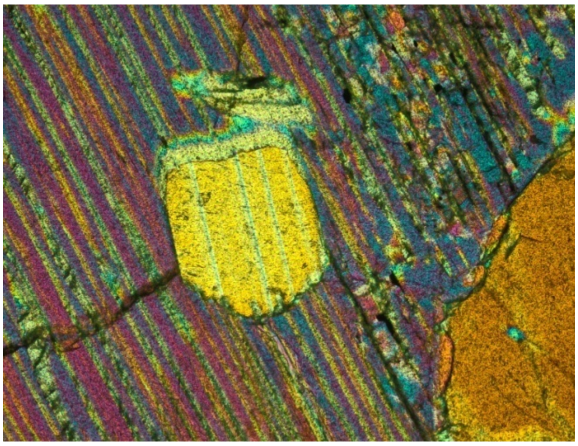

Figure 31: Photomicrograph of thin section 308.90. Cross polarized light, magnification 100×. Length of lower image edge: 1.2 mm. Pl inclusion in a Cpx grain with exsolution lamellae of Opx.

Sample 307.00 (HW Anorthosite)

Figure 32: Photograph of thin section 307.00 under a transmitted light microscope. Cross polarised light. Size of 3.1 cm by 2.1 cm. Thickness of thin section 35–40 μm.

Except from a few oikocrysts, this sample shows an equigranular cumulate texture of medium grain sizes (2 mm to 5 mm in length) (Figure 32). Subhedral to anhedral plagioclase (Figure 33), along with anhedral orthopyroxene oikocrysts form the cumulus phases, while clinopyroxene that mainly occur as anhedral oikocrysts forms the intercumulus phase. Pyroxene oikoyrsts are confined to the lower third of the thin section, where this creates a poikilitic texture. Single anhedral clinopyroxene grains < 1 mm also fill interstices between plagioclases in the upper part of the thin section. Grain boundary angles of 120° between plagioclase grains, indicating later equilibration, are common. Plagioclase laths preferentially show subhorizontal orientation. No continuous fractures that cross grain boundaries or veins are visible. Opaque phases and alteration features are virtually absent. According to the mineral abundances (plagioclase ~85%, clinopyroxene ~10% and ortho-pyroxene ~5%) the rock type in the lower half of the thin section is classified as gabbronorite, while in the upper two thirds it is classified as anorthosite or anorthositic adcumulate (plagioclase >95%, clinop-yroxene <5%). Plagioclase is the dominant mineral phase. Grains appear anhedral granular or subhedral lathlike. Subhedral grains are more abundant in areas with poikilitic texture (Figure 34). Grain sizes vary between 1 mm and 5 mm in length, but are *ca.* 2 mm on average. Maximum interference colour is bright yellow of 1st order. Polysynthetic and wedge-shaped deformation twins are very common.

Orthopyroxene only appears as two anhedral oikocrysts that are *ca.* 1 cm in length. One grain appears brownish, the other transparent. Fractures of no distinct orientation are common. A higher relief towards plagioclase and maximum interference colours (dark brown of 1st order) are characteristic.

Greenish clinopyroxene appears as a coarse anhedral oikocryst (2 cm in length) in the lower left corner of the thin section and as fine interstitial grains <1 mm in the upper part. Oblique extinction towards exsolution lamellae and maximum interference colour (red of 2nd order) are characteristic.

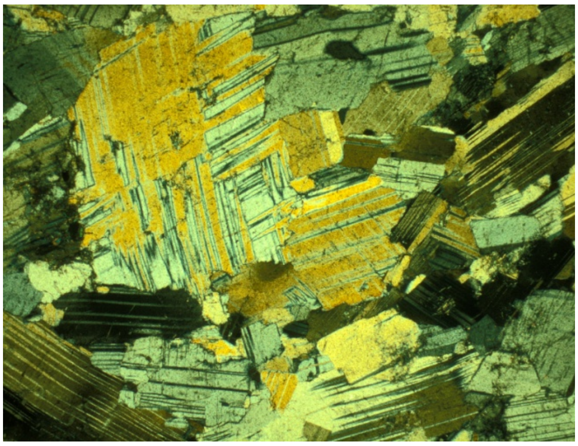

Figure 33: Photomicrograph of thin section 307.00. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Cumulus Pl grains from the upper part of thin section 307.00.

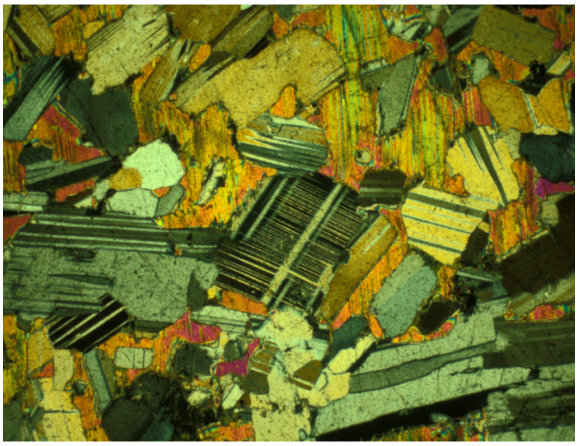

Figure 34: Photomicrograph of thin section 307.00. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Pl grains embedded in a Cpx oikocryst from the lower left corner of thin section 307.00.

Sample 277.35

Figure 35: Photograph of thin section 277.35 under a transmitted light microscope. Cross polarized light. Size of 3.6 cm by 2.1 cm. Thickness of thin section 35–40 µm.

This sample shows an inequigranular mesocumulate texture with mainly fine to medium grained plagioclase (< 1 mm to 3 mm in length) and medium grained orthopyroxene (2 mm to 5 mm in length) (Figure 35). Anhedral to subhedral orthopyroxene, along with coarser plagioclase fraction (2 mm to 3 mm in length) forms the cumulus phase. The finer plagioclase fraction (< 2 mm) forms the intercumulus phase. Elongate mineral grains tend to show subhorizontal orientation. The mineral distribution within the thin section is homogeneous. According to the mineral abundances (plagioclase ~75%, orthopyroxene <25% and clinopyroxene <5%) this rock is classified as leuconorite. No continuous fractures that cross grain boundaries or veins are visible. Opaque phases and alteration features are virtually absent.

Plagioclase occurs both as cumulus and intercumulus phase, as well as fine inclusions (< 1 mm) within orthopyroxene grains (Figure 36). Plagioclase shows two grain sizes fractions: a) ≤ 1 mm and b) 2 mm to 3 mm. The finer plagioclase fraction is mainly anhedral and granular, while the coarser fraction is predominantly subhedral and lathlike. Maximum interference colour is bright yellow of 1st order. Undulose extinction, polysynthetic and wedge-shaped deformation twins are common. Embayed grain boundaries between plagioclase grains, indicating disequilibrium, are abundant (Figure 37).

Orthopyroxene appears as light orange/brownish mainly anhedral, rarely subhedral grains, 2 mm to 5 mm in length. Granular and elongated grains are equally frequent. Fractures of no distinct orientation are abundant. A medium relief and the maximum interference colour (purple of 1st order) are indicative. Exsolution lamellae are virtually absent.

Clinopyroxene is only accessory and appears as a single anhedral grain of medium size (3 mm in length) and as rare finer grains predominantly at the rims of orthopyroxene grains. Greenish colour, oblique extinction towards exsolution lamellae and maximum interference colour (red of 2nd order) are indicative. Biotite is very rare and occurs as brown anhedral grains < 1 mm in association with orthopyroxene.

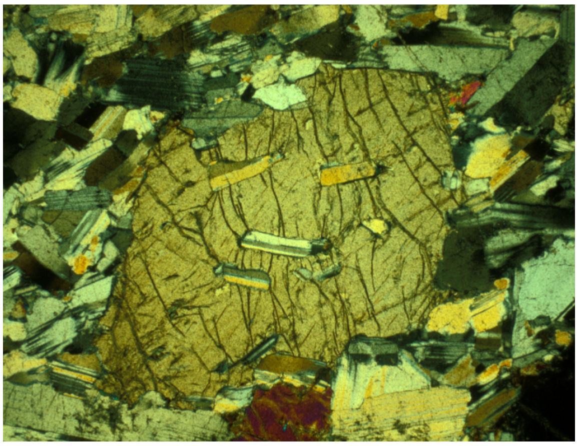

Figure 36: Photomicrograph of thin section 277.35. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Pl inclusions within an Opx grain.

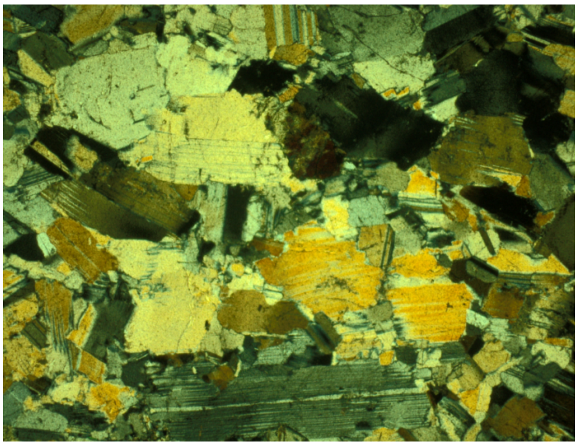

Figure 37: Photomicrograph of thin section 277.35. Cross polarized light, magnification 25×. Length of lower image edge: 4.5 mm. Pl grains of various grain sizes, partly with embayed grain boundaries.