Appendix A

Methodes of Sample Characterisation

A.1 Mineral assemblage

The modal analysis of the mineral phases of the serpentinite was performed by X-ray diffraction. In case of Chephren amphibolite, besides the two major phases plagioclase and hornblende, the amphibolite contains minor mineral phases of less than 2 vol%, which are relevant for the interpretation of the ultrasonic data. As the analytic uncertainty of X-ray diffraction is on the order of 3 - 4 %, the modal composition of the amphibolite was also quantified by point counting. Furthermore, the ore content of the serpentinite was obtained by point counting. Per analysis 600 to 1000 points were counted in several thinsections. In dependence of the grain size an increment of 1 mm (amphibolite) and 0.15 mm (serpentinite) was chosen. The modal composition, average density, and grain size of both rock samples is summarised in Tab. A.1.

rock	**modal analysis [vol%]**	ρ [**g cm**$^{-3}$]	**porosity [%]**	**grain size [mm]**
Amphibolite	61.1 plg, 30.7 hbl, 3.6 ac, 2.6 epi, 1.2 pump, 0.4 chl, ms, ore	2.82	0.06	0.2-2
Serpentinite	39.1 ant, 42.9 ol, 12.6 di, 3.1 hed, 1.4 chl, 0.9 ore	2.88	0.18	$<$0.25

Abbreviations: ac = actinolite, ant = antigorite, chl = chlorite, di = diopside, epi = epidote, hbl = hornblende, hed = hedenbergit, ms = muscovite, ol = olivine, plg = plagioclase, pump = pumpellyite

Table A.1: *Modal composition on the basis of point counting (amphibolite) and X-ray diffraction (serpentinite), average density, and grain size of the samples.*

The mineral assemblages were characterised by electron microprobing. The analyses are presented in Tabs. A.2 to A.10.

Table A.2: ***Chephren amphibolite*** - *Plagioclase analyses of the starting material (before the experiment) and quenched samples (*nE).*

	1		2		3		4		5		6		7		8		9		10		11	
sample	CHA		CHA		CHA		CHA		CHA		CHA		CHA		CHC		CHC		CHC		CHC	
comment	102-5		109		135-4		137-3		147		172-d		120		60		70		72		76	
SiO_2	47.91		48.91		47.72		48.69		48.54		47.71		48.85		49.54		50.34		48.87		42.85	
Al_2O_3	33.78		32.89		33.16		32.89		33.29		33.44		32.77		32.48		32.07		32.38		28.34	
Fe_2O_3	0.18		0.20		0.19		0.21		0.15		0.22		0.23		0.23		0.17		0.22		6.01	
FeO	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
MnO	0.02		0.00		0.00		0.00		0.00		0.03		0.02		0.00		0.00		0.00		0.10	
MgO	0.00		0.01		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.02	
CaO	16.78		16.02		16.81		15.97		16.48		16.45		15.78		15.48		14.88		15.34		20.89	
Na_2O	2.06		2.77		2.30		2.54		2.41		2.57		2.82		2.98		3.25		3.09		1.51	
K_2O	0.03		0.05		0.04		0.08		0.04		0.04		0.05		0.06		0.09		0.05		0.00	
BaO	0.00		0.00		0.00		0.00		0.01		0.00		0.00		0.00		0.00		0.00		0.00	
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Total	100.76		100.85		100.22		100.38		100.92		100.46		100.52		100.77		100.80		99.95		99.72	
	=====		=====		=====		=====		=====		=====		=====		=====		=====		=====		=====	
	Numbers of ions: calculation based on 5 cations and 8 oxygens																					
Si	2.18		2.21		2.18		2.22		2.20		2.17		2.22		2.24		2.28		2.23		2.02	
Al	1.81	4.00	1.76	3.98	1.79	3.97	1.77	3.99	1.78	3.98	1.79	3.97	1.75	3.98	1.73	3.98	1.71	3.99	1.74	3.97	1.57	3.80
Fe^{3+}	0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.21	
Fe^{2+}	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Mn	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Mg	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ca	0.82	1.00	0.78	1.02	0.82	1.03	0.78	1.01	0.80	1.02	0.80	1.03	0.77	1.02	0.75	1.02	0.72	1.01	0.75	1.03	1.05	1.20
Na	0.18		0.24		0.20		0.22		0.21		0.23		0.25		0.26		0.28		0.27		0.14	
K	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.01		0.00		0.00	
Ba	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
ENDMEMBERS																						
[-Or-]	*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.01*		*0.00*		*0.00*	
[-Ab-]	*0.18*		*0.24*		*0.20*		*0.22*		*0.21*		*0.22*		*0.24*		*0.26*		*0.28*		*0.27*		*0.12*	
[-An-]	*0.82*		*0.76*		*0.80*		*0.77*		*0.79*		*0.78*		*0.75*		*0.74*		*0.71*		*0.73*		*0.88*	

Table A.2 continued: ***Chephren amphibolite*** - *Plagioclase analyses.*

	12		13		14		15		16		17		18		19		20		21		22	
sample	CHAnE		CHAnE		CHAnE		CHAnE		CHAnE		CHAnE		CHAnE		CHAnE		CHAnE		CHAnE		CHAnE	
comment	32		114		119		124		142		143		144		145		146		147		148	
SiO_2	48.65		47.39		47.05		48.79		48.40		49.50		49.81		48.95		47.62		47.35		48.04	
Al_2O_3	32.58		33.35		33.51		32.76		33.00		31.92		31.87		32.42		32.77		33.02		33.22	
Fe_2O_3	0.25		0.10		0.15		0.18		0.17		0.18		0.18		0.20		0.17		0.18		0.21	
FeO	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
MnO	0.00		0.00		0.00		0.00		0.01		0.00		0.00		0.03		0.03		0.00		0.00	
MgO	0.01		0.00		0.00		0.00		0.01		0.00		0.00		0.00		0.00		0.00		0.00	
CaO	15.98		16.83		16.95		16.12		16.47		15.12		14.90		15.86		16.33		16.63		16.52	
Na_2O	2.56		2.01		1.99		2.46		2.28		2.99		3.15		2.61		2.29		2.13		2.19	
K_2O	0.06		0.05		0.03		0.06		0.06		0.07		0.08		0.07		0.04		0.06		0.04	
BaO	0.02		0.00		0.00		0.03		0.00		0.01		0.00		0.05		0.00		0.00		0.00	
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Total	100.11		99.73		99.68		100.4		100.4		99.79		99.99		100.19		99.25		99.37		100.22	
	=====		=====		=====		=====		=====		=====		=====		=====		=====		=====		=====	
	Numbers of ions: calculation based on 5 cations and 8 oxygens																					
Si	2.22	3.99	2.18	3.99	2.16	3.99	2.22	3.99	2.21	3.99	2.26	3.99	2.27	3.99	2.24	3.99	2.20	3.98	2.18	3.98	2.20	3.99
Al	1.75		1.81		1.82		1.76		1.77		1.72		1.71		1.74		1.78		1.79		1.79	
Fe^{3+}	0.01		0.00		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01	
Fe^{2+}	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.02	0.00	1.02	0.00	1.01
Mn	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Mg	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ca	0.78		0.83		0.84		0.79		0.81		0.74		0.73		0.78		0.81		0.82		0.81	
Na	0.23		0.18		0.18		0.22		0.20		0.26		0.28		0.23		0.20		0.19		0.19	
K	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ba	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
ENDMEMBERS																						
[-Or-]	*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.01*		*0.00*		*0.00*		*0.00*		*0.00*	
[-Ab-]	*0.22*		*0.18*		*0.18*		*0.22*		*0.20*		*0.26*		*0.28*		*0.23*		*0.20*		*0.19*		*0.19*	
[-An-]	*0.77*		*0.82*		*0.82*		*0.78*		*0.80*		*0.73*		*0.72*		*0.77*		*0.80*		*0.81*		*0.81*	

Table A.2 continued: ***Chephren amphibolite*** - *Plagioclase analyses.*

sample	23 CHAnE		24 CHAnE		25 CHAnE		26 CHAnE		27 CHAnE		28 CHAnE		29 CHAnE		30 CHAnE		31 CHAnE		32 CHAnE		33 CHAnE	
comment	149		150		156		157		161		162		174		175		176		178		117	
SiO_2	47.60		47.57		48.39		48.98		49.77		48.64		47.53		48.72		49.37		49.23		47.87	
Al_2O_3	32.59		33.59		32.73		32.16		32.15		32.50		33.37		32.67		32.39		32.32		32.32	
Fe_2O_3	0.16		0.09		0.17		0.25		0.23		0.18		0.18		0.18		0.20		0.15		0.19	
FeO	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
MnO	0.00		0.00		0.00		0.00		0.00		0.01		0.00		0.05		0.00		0.02		0.00	
MgO	0.00		0.00		0.00		0.00		0.00		0.02		0.00		0.02		0.00		0.00		0.00	
CaO	16.34		17.09		15.01		15.55		15.35		15.86		16.97		15.78		15.54		15.79		16.16	
Na_2O	2.29		1.95		2.89		2.71		2.91		2.51		1.96		2.55		2.82		2.68		2.48	
K_2O	0.09		0.03		0.05		0.05		0.07		0.05		0.04		0.07		0.08		0.06		0.06	
BaO	0.00		0.00		0.02		0.00		0.00		0.00		0.02		0.01		0.06		0.00		0.00	
	----		----		----		----		----		----		----		----		----		----		----	
Total	99.07		100.32		99.26		99.70		100.48		99.77		100.07		100.05		100.46		100.25		99.08	
	=====		=====		=====		=====		=====		=====		=====		=====		=====		=====		=====	
	Numbers of ions: calculation based on 5 cations and 8 oxygens																					
Si	2.20	3.98	2.18	3.99	2.22	4.00	2.25	3.99	2.26	3.99	2.23	3.99	2.18	3.99	2.23	3.99	2.25	3.99	2.24	3.99	2.21	3.98
Al	1.78		1.81		1.77		1.74		1.72		1.76		1.80		1.76		1.74		1.74		1.76	
Fe^{3+}	0.01		0.00		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01	
Fe^{2+}	0.00	1.02	0.00	1.01	0.00	1.00	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.01	0.00	1.02
Mn	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Mg	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ca	0.81		0.84		0.74		0.76		0.75		0.78		0.83		0.77		0.76		0.77		0.80	
Na	0.20		0.17		0.26		0.24		0.26		0.22		0.17		0.23		0.25		0.24		0.22	
K	0.01		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ba	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
ENDMEMBERS																						
[-Or-]	*0.01*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*	
[-Ab-]	*0.20*		*0.17*		*0.26*		*0.24*		*0.26*		*0.22*		*0.17*		*0.23*		*0.25*		*0.23*		*0.22*	
[-An-]	*0.79*		*0.83*		*0.74*		*0.76*		*0.74*		*0.78*		*0.83*		*0.77*		*0.75*		*0.76*		*0.78*	

Table A.2 continued: ***Chephren amphibolite*** - *Plagioclase analyses.*

	34		35		36		37		38		39		40		41		42	
sample	CHAnE		CHBnE		CHBnE		CHBnE		CHBnE		CHCnE		CHCnE		CHCnE		CHCnE	
comment	141		67		121		171		175		70		78		86		88	
SiO_2	56.67		49.27		49.75		47.96		49.70		49.08		50.62		47.01		48.15	
Al_2O_3	23.71		32.68		32.17		33.23		31.29		32.64		31.55		33.73		32.64	
Fe_2O_3	2.15		0.14		0.19		0.19		0.17		0.20		0.21		0.24		0.17	
FeO	0.00		0.00		0.01		0.00		0.00		0.00		0.00		0.00		0.00	
MnO	0.04		0.00		0.00		0.01		0.00		0.03		0.00		0.06		0.00	
MgO	1.62		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
CaO	8.79		16.06		15.49		16.39		14.80		15.85		14.63		17.18		16.16	
Na_2O	6.22		2.62		2.83		2.31		3.27		2.71		3.29		1.91		2.57	
K_2O	0.15		0.05		0.07		0.06		0.08		0.05		0.08		0.04		0.07	
BaO	0.00		0.00		0.00		0.04		0.01		0.00		0.00		0.00		0.02	
	----		----		----		----		----		----		----		----		----	
Total	99.35		100.82		100.51		100.19		99.32		100.56		100.38		100.17		99.78	
	=====		=====		=====		=====		=====		=====		=====		=====		=====	
	Numbers of ions: calculation based on 5 cations and 8 oxygens																	
Si	2.57		2.23		2.26		2.19		2.28		2.23		2.30		2.15		2.21	
Al	1.27	3.91	1.75	3.99	1.72	3.99	1.79	3.99	1.69	3.98	1.75	3.99	1.69	3.99	1.82	3.98	1.76	3.97
Fe^{3+}	0.07		0.00		0.01		0.01		0.01		0.01		0.01		0.01		0.01	
Fe^{2+}	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Mn	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Mg	0.11		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ca	0.43	1.09	0.78	1.01	0.75	1.01	0.80	1.01	0.73	1.02	0.77	1.01	0.71	1.01	0.84	1.02	0.79	1.03
Na	0.55		0.23		0.25		0.20		0.29		0.24		0.29		0.17		0.23	
K	0.01		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ba	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
ENDMEMBERS																		
[-Or-]	*0.01*		*0.00*		*0.00*		*0.00*		*0.00*		*0.00*		*0.01*		*0.00*		*0.00*	
[-Ab-]	*0.56*		*0.23*		*0.25*		*0.20*		*0.28*		*0.24*		*0.29*		*0.17*		*0.22*	
[-An-]	*0.44*		*0.77*		*0.75*		*0.79*		*0.71*		*0.76*		*0.71*		*0.83*		*0.77*	

Table A.3: ***Chephren amphibolite*** - *Amphibole analyses of the starting material (CHA, CHB, CHC) and of quenched samples (*nE).*

	1		2		3		4		5		6		7		8		9		10	
sample	CHA		CHA		CHA		CHA		CHA		CHA		CHA		CHA		CHA		CHB	
comment	98		99		100		101		116		117		121		124		125		5	
SiO_2	52.04		45.72		52.53		53.48		44.83		47.46		44.26		44.42		44.40		45.61	
TiO_2	0.22		1.40		0.14		0.12		1.36		1.01		1.34		1.75		1.61		1.65	
Al_2O_3	5.04		10.38		3.69		3.07		11.09		10.15		11.54		11.39		11.59		10.51	
FeO	12.24		12.91		14.88		14.60		13.16		11.94		13.55		13.67		13.24		13.60	
MnO	0.22		0.16		0.33		0.39		0.17		0.13		0.18		0.17		0.17		0.14	
MgO	16.10		13.68		14.31		14.66		13.30		14.18		13.10		13.21		12.80		13.53	
CaO	12.76		12.49		12.75		12.66		12.45		12.32		12.37		12.29		12.33		12.47	
Na_2O	0.48		1.39		0.30		0.31		1.68		1.18		1.76		1.82		1.99		1.49	
K_2O	0.32		0.79		0.16		0.18		0.84		0.70		0.84		0.85		0.88		0.84	
F	0.19		0.27		0.04		0.00		0.21		0.23		0.30		0.27		0.23		0.21	
Cl	0.00		0.00		0.01		0.01		0.02		0.02		0.00		0.02		0.01		0.00	
H_2O	0.40		0.40		0.40		0.40		0.40		0.40		0.40		0.40		0.40		0.40	
	100.02		*99.58*		*99.53*		*99.88*		*99.50*		*99.71*		*99.63*		*100.24*		*99.64*		*100.44*	
-O = F	0.08		0.11		0.02		0.00		0.09		0.10		0.12		0.11		0.10		0.09	
-O = Cl	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Total	99.94		99.47		99.51		99.88		99.41		99.61		99.51		100.12		99.54		100.36	
	Numbers of ions: calculation based on 24 oxygens																			
Si	7.66	8.00	6.87	8.00	7.87	8.00	7.97	8.00	6.78	8.00	7.05	8.00	6.69	8.00	6.68	8.00	6.71	8.00	6.83	8.00
Al(IV)	0.34		1.13		0.13		0.03		1.22		0.95		1.31		1.32		1.29		1.17	
Al(VI)	0.54	5.63	0.71	5.57	0.53	5.65	0.52	5.66	0.75	5.59	0.83	5.58	0.74	5.58	0.70	5.60	0.77	5.54	0.69	5.61
Ti	0.02		0.16		0.02		0.01		0.15		0.11		0.15		0.20		0.18		0.19	
Fe^{3+}	0.09		0.13		0.02		0.00		0.11		0.11		0.14		0.13		0.11		0.10	
Fe^{2+}	1.42		1.49		1.84		1.82		1.56		1.37		1.57		1.59		1.56		1.60	
Mn	0.03		0.02		0.04		0.05		0.02		0.02		0.02		0.02		0.02		0.02	
Mg	3.53		3.06		3.20		3.26		3.00		3.14		2.95		2.96		2.88		3.02	
Ca	2.01		2.01		2.05		2.02		2.02		1.96		2.00		1.98		2.00		2.00	
Na	0.14	0.20	0.40	0.56	0.09	0.12	0.09	0.12	0.49	0.65	0.34	0.47	0.51	0.68	0.53	0.69	0.58	0.75	0.43	0.59
K	0.06		0.15		0.03		0.03		0.16		0.13		0.16		0.16		0.17		0.16	
OH	0.18	0.27	0.25	0.38	0.04	0.06	0.00	0.00	0.20	0.31	0.22	0.33	0.28	0.43	0.25	0.38	0.22	0.33	0.20	0.29
F	0.09		0.13		0.02		0.00		0.10		0.11		0.14		0.13		0.11		0.10	
Cl	0.00		0.00		0.00		0.00		0.00		0.01		0.00		0.00		0.00		0.00	

Table A.3 continued: ***Chephren amphibolite*** - *Amphibole analyses.*

sample	11 CHB		12 CHB		13 CHB		14 CHB		15 CHB		16 CHB		17 CHB		18 CHB		19 CHC2		20 CHC2	
comment	6		7		12		13		14		15		16		17		18		22	
SiO_2	49.16		44.18		45.12		44.78		44.46		44.66		44.14		44.16		51.24		46.36	
TiO_2	0.17		1.88		1.79		1.90		1.93		1.81		1.95		2.00		0.14		1.02	
Al_2O_3	7.20		11.43		10.64		11.10		11.24		10.74		11.44		11.63		5.90		10.28	
FeO	14.56		13.76		13.80		13.83		13.82		13.69		13.95		14.08		14.61		12.75	
MnO	0.17		0.16		0.21		0.18		0.14		0.15		0.20		0.18		0.22		0.18	
MgO	13.63		12.88		13.35		13.21		12.98		13.06		12.84		12.85		12.72		14.05	
CaO	12.93		12.34		12.63		12.63		12.38		12.58		12.47		12.31		13.07		12.50	
Na_2O	0.67		1.83		1.56		1.68		1.76		1.72		1.94		1.96		0.46		1.64	
K_2O	0.22		0.84		0.86		0.85		0.83		0.83		0.87		0.82		0.20		0.76	
F	0.08		0.22		0.26		0.22		0.25		0.30		0.21		0.18		0.02		0.29	
Cl	0.02		0.02		0.01		0.00		0.02		0.02		0.00		0.00		0.02		0.01	
H_2O	0.40		0.40		0.40		0.40		0.40		0.40		0.40		0.40		0.40		0.40	
	99.22		*99.93*		*100.63*		*100.77*		*100.19*		*99.95*		*100.40*		*100.56*		*98.98*		*100.23*	
-O = F	0.03		0.09		0.11		0.09		0.11		0.12		0.09		0.07		0.01		0.12	
-O = Cl	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Total	99.18		99.83		100.51		100.67		100.08		99.82		100.31		100.48		98.97		100.10	
	Numbers of ions: calculation based on 24 oxygens																			
Si	7.42	8.00	6.68	8.00	6.76	8.00	6.71	8.00	6.69	8.00	6.73	8.00	6.65	8.00	6.65	8.00	7.73	8.00	6.91	8.00
Al(IV)	0.58		1.32		1.24		1.29		1.31		1.27		1.35		1.35		0.27		1.09	
Al(VI)	0.70	5.65	0.71	5.59	0.64	5.58	0.67	5.59	0.69	5.58	0.64	5.53	0.69	5.58	0.71	5.62	0.78	5.52	0.72	5.56
Ti	0.02		0.21		0.20		0.21		0.22		0.21		0.22		0.23		0.02		0.11	
Fe^{3+}	0.04		0.11		0.13		0.11		0.12		0.15		0.10		0.08		0.01		0.14	
Fe^{2+}	1.80		1.63		1.60		1.63		1.62		1.58		1.66		1.69		1.83		1.45	
Mn	0.02		0.02		0.03		0.02		0.02		0.02		0.03		0.02		0.03		0.02	
Mg	3.07		2.90		2.98		2.95		2.91		2.94		2.88		2.88		2.86		3.12	
Ca	2.09		2.00		2.03		2.03		2.00		2.03		2.01		1.99		2.11		2.00	
Na	0.19	0.24	0.54	0.70	0.45	0.62	0.49	0.65	0.51	0.67	0.50	0.66	0.57	0.73	0.57	0.73	0.13	0.17	0.47	0.62
K	0.04		0.16		0.16		0.16		0.16		0.16		0.17		0.16		0.04		0.14	
OH	0.08	0.12	0.21	0.32	0.25	0.38	0.21	0.32	0.24	0.36	0.28	0.43	0.20	0.30	0.17	0.25	0.02	0.03	0.28	0.41
F	0.04		0.11		0.12		0.11		0.12		0.14		0.10		0.08		0.01		0.14	
Cl	0.01		0.00		0.00		0.00		0.00		0.01		0.00		0.00		0.00		0.00	

Table A.3 continued: ***Chephren amphibolite*** - *Amphibole analyses.*

	21	22	23	24	25	26	27	28	29	30
sample	CHC2	CHC2	CHAnE	CHAnE	CHAnE	CHAnE	CHAnE	CHAnE	CHBnE	CHBnE
comment	24	25	10	31	116	120	132	134	94	95
SiO_2	44.66	51.09	44.40	44.62	42.92	44.46	43.88	42.18	44.33	44.15
TiO_2	0.91	4.40	1.35	1.37	1.35	1.43	1.41	1.02	1.97	2.01
Al_2O_3	12.57	3.33	11.55	12.01	12.73	10.51	12.62	15.22	11.30	11.28
FeO	13.11	11.11	13.99	12.54	12.71	13.34	12.48	11.02	13.94	13.96
MnO	0.14	0.22	0.15	0.22	0.10	0.20	0.16	0.13	0.15	0.18
MgO	12.03	13.96	12.44	12.46	11.76	13.14	12.03	9.96	12.72	12.89
CaO	13.68	15.24	12.49	13.17	12.92	12.44	13.19	14.95	12.39	12.39
Na_2O	1.23	0.23	1.74	1.53	1.39	1.42	1.35	1.09	1.81	1.83
K_2O	0.64	0.10	0.90	0.83	0.94	0.85	0.76	0.61	0.83	0.86
F	0.24	0.28	0.25	0.25	0.24	0.28	0.26	0.23	0.24	0.24
Cl	0.01	0.00	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01
H_2O	0.40	0.40	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
	99.59	*100.35*	*99.57*	*99.31*	*97.37*	*98.36*	*98.45*	*96.69*	*99.97*	*100.07*
-O = F	0.10	0.12	0.11	0.10	0.10	0.12	0.11	0.10	0.10	0.10
-O = Cl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	99.49	100.23	99.46	99.21	97.26	98.24	98.34	96.59	99.87	99.97
	Numbers of ions: calculation based on 24 oxygens									
Si	6.73	7.53	6.72	6.73	6.62	6.79	6.67	6.51	6.69	6.66
Al(IV)	1.27 } 8.00	0.47 } 8.00	1.28 } 8.00	1.27 } 8.00	1.38 } 8.00	1.21 } 8.00	1.33 } 8.00	1.49 } 8.00	1.31 } 8.00	1.34 } 8.00
Al(VI)	0.96	0.10	0.79	0.87	0.94	0.68	0.93	1.28	0.70	0.67
Ti	0.10	0.49	0.15	0.16	0.16	0.16	0.16	0.12	0.22	0.23
Fe^{3+}	0.11	0.13	0.13	0.12	0.12	0.14	0.13	0.11	0.11	0.12
Fe^{2+}	1.54 } 5.43	1.24 } 5.05	1.65 } 5.54	1.46 } 5.44	1.52 } 5.45	1.57 } 5.57	1.46 } 5.43	1.31 } 5.12	1.65 } 5.56	1.65 } 5.58
Mn	0.02	0.03	0.02	0.03	0.01	0.03	0.02	0.02	0.02	0.02
Mg	2.70	3.07	2.81	2.80	2.70	2.99	2.73	2.29	2.86	2.90
Ca	2.21	2.41	2.03	2.13	2.14	2.04	2.15	2.47	2.00	2.00
Na	0.36	0.06	0.51	0.45	0.42	0.42	0.40	0.33	0.53	0.53
K	0.12 } 0.48	0.02 } 0.08	0.17 } 0.69	0.16 } 0.61	0.18 } 0.60	0.16 } 0.59	0.15 } 0.55	0.12 } 0.45	0.16 } 0.69	0.17 } 0.70
OH	0.22	0.26	0.24	0.23	0.24	0.27	0.25	0.23	0.22	0.23
F	0.11 } 0.34	0.13 } 0.39	0.12 } 0.37	0.12 } 0.35	0.12 } 0.36	0.13 } 0.41	0.12 } 0.38	0.11 } 0.34	0.11 } 0.34	0.11 } 0.34
Cl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A.4: ***Chephren amphibolite*** - *Epidote analyses of the starting material (CHA, CHB, CHC) and of quenched samples (CHAnE, CHBnE, CHCnE, CHDnE).*

	1		2		3		4		5		6		7	
sample	CHA		CHA		CHA		CHA		CHA		CHA		CHB	
comment	144-2		146-3		155-a		156-b		159-c		131-4		8	
SiO_2	38.53		38.66		42.57		38.57		37.76		38.98		38.41	
TiO_2	0.00		0.07		0.04		0.00		0.02		0.06		0.01	
Al_2O_3	26.19		25.17		28.24		25.05		21.95		25.43		22.68	
Fe_2O_3	9.44		10.38		5.94		11.28		15.02		11.21		14.33	
MgO	0.29		0.07		0.03		0.03		0.01		0.03		0.00	
MnO	0.00		0.10		0.08		0.13		0.05		0.29		0.06	
CaO	23.84		24.10		20.65		23.85		23.64		23.62		24.07	
	----		----		----		----		----		----		----	
Total	98.29		98.55		97.55		98.91		98.45		99.62		99.56	
	=====		=====		=====		=====		=====		=====		=====	
	calculation based on 25 oxygens: all Fe=3+, all Mn=2+													
Si	6.02	6.02	6.05	6.05	6.49	6.49	6.03	6.03	6.02	6.02	6.04	6.04	6.04	6.04
$Al^{(IV)}$	0.00		0.00		0.00		0.00		0.00		0.00		0.00	
$Al^{(VI)}$	4.82	5.93	4.65	5.88	5.07	5.76	4.62	5.94	4.13	5.93	4.65	5.96	4.20	5.90
Fe^{3+}	1.11		1.22		0.68		1.33		1.80		1.31		1.70	
Ti	0.00		0.01		0.00		0.00		0.00		0.01		0.00	
Mg	0.07	4.06	0.02	4.07	0.01	3.39	0.01	4.02	0.00	4.05	0.01	3.97	0.00	4.06
Mn^{2+}	0.00		0.01		0.01		0.02		0.01		0.04		0.01	
Ca	3.99		4.04		3.37		4.00		4.04		3.92		4.06	

Table A.4 continued: ***Chephren amphibolite*** - *Epidote analyses.*

	8		9		10		11		12		13		14	
sample	CHC		CHC		CHC		CHAnE		CHAnE		CHAnE		CHAnE	
comment	143		145		154		111		125		2		3	
SiO_2	38.56		38.40		43.67		41.13		38.06		37.35		38.78	
TiO_2	0.01		0.15		0.00		0.01		0.04		0.15		0.02	
Al_2O_3	26.57		25.55		27.86		26.85		25.96		22.98		25.18	
Fe_2O_3	9.23		11.35		7.73		7.56		10.24		12.79		11.43	
MgO	0.61		0.08		0.03		0.01		0.05		0		0	
MnO	0.02		0.32		0.03		0.06		0.04		0.11		0.13	
CaO	23.52		22.99		18.23		20.24		23.6		22.96		24.04	
	----		----		----		----		----		----		----	
Total	98.52		98.84		97.55		95.86		97.99		96.34		99.58	
	=====		=====		=====		=====		=====		=====		=====	
	calculation based on 25 oxygens: all Fe=3+, all Mn=2+													
Si	6.00	6.00	6.00	6.00	6.62	6.62	6.43	6.43	5.98	6	6.04	6.04	6.03	6.03
$Al^{(IV)}$	0.00		0.00		0.00		0		0.02		0		0	
$Al^{(VI)}$	4.87	5.96	4.70	6.05	4.98	5.86	0	5.83	0	6.01	0.02	5.95	0	5.95
Fe^{3+}	1.08		1.33		0.88		4.94		4.79		4.38		4.61	
Ti	0.00		0.02		0.00		0.89		1.21		1.56		1.34	
Mg	0.14	4.07	0.02	3.91	0.01	2.97	0	3.4	0.01	3.99	0	3.99	0	4.02
Mn^{2+}	0.00		0.04		0.00		0.01		0.01		0.02		0.02	
Ca	3.92		3.85		2.96		3.39		3.98		3.98		4	

Table A.4 continued: ***Chephren amphibolite*** - *Epidote analyses.*

	15		16		17		18		19		20		21	
sample	CHBnE		CHBnE		CHBnE		CHCnE		CHCnE		CHCnE		CHCnE	
comment	12		192		197		79		108		75		109	
SiO_2	38.18		41.19		39.26		37.82		38.06		38.93		37.44	
TiO_2	0.02		0.05		0.06		0.13		0.04		0.06		0.13	
Al_2O_3	23.32		24.61		24.42		25.20		24.33		25.65		24.09	
Fe_2O_3	13.65		10.63		11.29		11.58		11.15		10.36		12.40	
MgO	0.00		0.61		0.64		0.02		0.00		0.02		0.03	
MnO	0.00		0.03		0.09		0.26		0.15		0.07		0.22	
CaO	23.95		22.59		23.90		23.71		22.23		23.54		23.67	
	----		----		----		----		----		----		----	
Total	99.12		99.71		99.66		98.72		95.96		98.63		97.98	
	=====		=====		=====		=====		=====		=====		=====	
	calculation based on 25 oxygens: all Fe=3+, all Mn=2+													
Si	6.02	6.02	6.31	6.31	6.09	6.09	5.94	6.00	6.11	6.11	6.07	6.07	5.95	6.00
$Al^{(IV)}$	0.00		0.00		0.00		0.06		0.00		0.00		0.05	
$Al^{(VI)}$	0.00	5.95	0.01	5.68	0.01	5.79	0.02	5.99	0.00	5.96	0.01	5.94	0.02	5.97
Fe^{3+}	4.33		4.45		4.46		4.61		4.60		4.71		4.47	
Ti	1.62		1.23		1.32		1.37		1.35		1.22		1.48	
Mg	0.00	4.04	0.14	3.85	0.15	4.13	0.00	4.03	0.00	3.84	0.00	3.95	0.01	4.07
Mn^{2+}	0.00		0.00		0.01		0.04		0.02		0.01		0.03	
Ca	4.04		3.71		3.97		3.99		3.82		3.93		4.03	

Table A.4 continued: ***Chephren amphibolite*** - *Epidote analyses.*

	22		23		24		25		26		27	
sample	CHCnE		CHCnE		CHCnE		CHDnE		CHDnE		CHDnE	
comment	100		113		153		62		65		154	
SiO_2	37.75		37.39		37.89		37.76		37.73		38.33	
TiO_2	0.24		0.09		0.09		0.08		0.04		0.06	
Al_2O_3	24.53		22.93		25.51		22.59		22.23		25.72	
Fe_2O_3	12.32		14.40		11.21		14.66		15.23		11.14	
MgO	0.00		0.00		0.03		0.01		0.01		0.03	
MnO	0.35		0.08		0.06		0.13		0.17		0.12	
CaO	23.29		23.36		23.55		23.30		23.32		23.77	
	----		----		----		----		----		----	
Total	98.48		98.25		98.34		98.53		98.73		99.17	
	=====		=====		=====		=====		=====		=====	
Si	5.96	6.00	5.96	6.00	5.96	6.00	6.00	6.00	6.00	6.00	5.97	6.00
$Al^{(IV)}$	0.04		0.04		0.04		0.00		0.00		0.03	
$Al^{(VI)}$	0.03	6.01	0.01	6.01	0.01	6.02	0.01	6.00	0.01	6.00	0.01	6.01
Fe^{3+}	4.52		4.27		4.69		4.23		4.17		4.70	
Ti	1.46		1.73		1.33		1.75		1.82		1.31	
Mg	0.00	3.99	0.00	4.00	0.01	3.98	0.00	3.99	0.00	4.00	0.01	3.99
Mn^{2+}	0.05		0.01		0.01		0.02		0.02		0.02	
Ca	3.94		3.99		3.97		3.97		3.97		3.97	

Table A.5: ***Chephren amphibolite*** - *Pumpellyite analyses of the starting material.*

	1		2		3		4		5		6		7		8		9	
sample	CHB		CHB		CHC		CHC		CHC		CHC		CHC		CHB		CHB	
comment	105		106		69		136		167		165		107		193		103	
SiO_2	37.97		38.87		39.81		38.15		37.88		39.51		39.26		39.78		38.04	
Al_2O_3	0.02		0.03		0.00		0.01		0.00		0.04		0.01		0.01		0.00	
Fe_2O_3	25.40		23.34		24.36		24.26		25.32		25.83		24.03		23.76		24.51	
FeO	4.79		4.19		6.06		5.27		4.90		4.30		4.21		6.87		4.71	
MnO	0.12		0.05		0.07		0.05		0.02		0.02		0.08		0.04		0.05	
MgO	2.23		3.04		1.04		2.59		2.19		2.06		2.98		1.54		2.74	
CaO	23.14		24.16		22.40		22.94		22.76		21.67		22.19		22.36		23.97	
Na_2O	0.12		0.19		0.41		0.07		0.05		0.02		0.16		0.04		0.16	
K_2O	0.01		0.02		0.05		0.02		0.02		0.03		0.02		0.00		0.01	
H_2O	6.00		6.00		6.00		6.00		6.00		6.00		6.00		6.00		6.00	
F	0.30		0.24		0.00		0.29		0.22		0.00		0.13		0.00		0.23	
	100.14		100.15		100.18		99.67		99.35		99.48		99.1		100.41		100.45	
$-O \equiv F$	0.13		0.10		0.00		0.12		0.09		0.00		0.06		0.00		0.10	
Total	100.01		100.04		100.18		99.54		99.26		99.48		99.03		100.41		100.35	
	Numbers of ions: calculation based on 14(O,OH)																	
Si	3.06		3.13		3.21		3.09		3.07		3.17		3.17		3.21		3.07	
Al	2.41		2.22		2.31		2.32		2.42		2.44		2.29		2.26		2.33	
Ti	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Fe^{2+}	0.32	3.01	0.28	2.87	0.41	2.85	0.36	2.99	0.33	3.02	0.29	2.98	0.28	2.94	0.46	2.91	0.32	2.98
Mn	0.01		0.00		0.00		0.00		0.00		0.00		0.01		0.00		0.00	
Mg	0.27		0.37		0.12		0.31		0.26		0.25		0.36		0.19		0.33	
Ca	2.00		2.09		1.93		1.99		1.98		1.86		1.92		1.93		2.07	
Na	0.02	2.02	0.03	2.12	0.06	2.00	0.01	2.01	0.01	1.99	0.00	1.87	0.03	1.95	0.01	1.94	0.02	2.10
K	0.00		0.00		0.01		0.00		0.00		0.00		0.00		0.00		0.00	
OH	3.22		3.23		3.22		3.25		3.24		3.21		3.23		3.23		3.23	
F	0.08	3.31	0.06	3.29	0.00	3.22	0.07	3.32	0.06	3.30	0.00	3.21	0.03	3.27	0.00	3.23	0.06	3.29

Table A.6: ***Chephren amphibolite*** - *Chlorite analyses of the starting material and of quenched samples (*nE).*

	1		2		3		4		5		6		7	
sample	CHA		CHC		CHC		CHC		CHC		CHC		CHBnE	
comment	111		51		85		86		87		112		226	
SiO_2	28.45		27.46		26.93		27.02		28.85		32.71		26.21	
TiO_2	0.00		0.01		0.04		0.01		0.00		0.03		0.00	
Al_2O_3	21.19		21.65		20.87		21.01		22.49		23.74		20.76	
FeO	19.79		21.40		22.96		22.86		18.99		16.33		24.07	
MgO	16.94		16.76		17.70		17.62		14.90		13.11		16.49	
MnO	0.25		0.27		0.27		0.24		0.21		0.19		0.21	
CaO	1.03		0.86		0.08		0.17		2.18		3.69		0.00	
Na_2O	0.21		0.31		0.09		0.13		0.72		0.97		0.01	
K_2O	0.05		0.02		0.04		0.03		0.02		0.02		0.01	
Total	87.91		88.74		88.98		89.09		88.36		90.79		87.76	
	calculation based on 28 oxygens: all Fe=2+													
Si	5.78	8.00	5.59	8.00	5.51	8.00	5.52	8.00	5.82	8.00	6.29	8.00	5.47	8.00
$Al^{(IV)}$	2.22		2.41		2.49		2.48		2.18		1.71		2.53	
Ti	0.00	11.72	0.00	11.87	0.01	11.99	0.00	11.98	0.00	11.65	0.00	11.20	0.00	11.97
$Al^{(VI)}$	2.86		2.78		2.54		2.58		3.17		3.66		2.59	
Fe^{2+}	3.37		3.64		3.93		3.90		3.20		2.62		4.21	
Mg	5.13		5.08		5.40		5.36		4.48		3.76		5.14	
Mn	0.04		0.05		0.05		0.04		0.04		0.03		0.04	
Ca	0.22		0.19		0.02		0.04		0.47		0.76		0.00	
Na	0.08		0.12		0.04		0.05		0.28		0.36		0.01	
K	0.01		0.00		0.01		0.01		0.01		0.00		0.00	

Table A.7: ***Chephren amphibolite*** - *Muscovite analyses.*

	1	2		*calculation based on 6 cations, 11 oxygens and 2 anions*			
sample	CHC	CHC					
comment	122	123		1		2	
SiO_2	46.73	46.81	Si	3.08	4.00	3.09	4.00
TiO_2	0.00	0.01	$Al^{(IV)}$	0.92		0.91	
Al_2O_3	37.24	36.55	Ti	0.00	2.02	0.00	2.00
Fe_2O_3	0.11	0.20	$Al^{(VI)}$	1.98		1.93	
FeO	0.00	0.00	Fe^{3+}	0.01		0.01	
MgO	0.01	0.02	Fe^{2+}	0.00		0.00	
MnO	0.34	0.58	Mn	0.00		0.00	
CaO	0.04	0.06	Mg	0.03		0.06	
Na_2O	0.19	0.24	Ca	0.00	0.95	0.00	0.95
K_2O	10.98	10.85	Na	0.02		0.03	
F	0.02	0.02	K	0.92		0.91	
Cl	0.01	0.01	F	0.00	1.87	0.00	2.00
H_2O	4.24	4.53	Cl	0.00		0.00	
	99.91	99.88	OH	1.87		2.00	
-O = F	0.01	0.01					
-O = Cl	0.00	0.00					
Total	99.90	99.87					

Table A.8: ***Malenco serpentinite*** *- Antigorite analyses.*

sample	1 Ma20	2 Ma20	3 Ma20	4 Ma20	5 Ma20	6 Ma20	7 Ma20	8 Ma20	9 Ma20	10 Ma20	11 Ma20
SiO_2	44.36	43.44	43.76	43.86	44.25	43.00	43.15	42.90	44.06	44.16	44.57
TiO_2	0.03	0.00	0.06	0.00	0.03	0.00	0.00	0.05	0.00	0.03	0.00
Al_2O_3	0.50	0.50	0.51	0.48	0.51	0.56	0.59	0.42	0.50	0.33	0.33
FeO	2.22	2.15	2.13	2.04	2.17	3.39	3.22	3.65	2.07	1.61	1.51
MnO	0.08	0.06	0.10	0.11	0.05	0.08	0.10	0.06	0.08	0.11	0.05
MgO	40.37	41.02	40.53	40.77	40.25	40.95	41.25	41.29	39.95	39.45	39.91
CaO	0.02	0.02	0.03	0.01	0.02	0.05	0.03	0.04	0.02	0.02	0.01
Na_2O	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.03	0.01
K_2O	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.02
Cr_2O_3	0.05	0.09	0.07	0.10	0.10	0.11	0.11	0.06	0.02	0.07	0.02
NiO	0.17	0.20	0.21	0.25	0.25	0.29	0.26	0.15	0.21	0.26	0.19
H_2O	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Total	99.80	99.50	99.38	99.64	99.64	100.43	100.72	100.61	98.92	98.07	98.61
	calculation based on 9 oxygens: all Fe=2+										
Si	2.08	2.05	2.06	2.06	2.08	2.02	2.02	2.02	2.08	2.10	2.10
Al	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02
Ti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe^{3+}	—	—	—	—	—	—	—	—	—	—	—
Fe^{2+}	0.09	0.08	0.08	0.08	0.09	0.13	0.13	0.14	0.08	0.06	0.06
Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mn	2.82	2.88	2.84	2.86	2.82	2.87	2.88	2.89	2.81	2.79	2.81
Na	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ca	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ni	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	2.95	3.01	2.97	2.98	2.95	3.06	3.06	3.07	2.94	2.89	2.90
OH	3.75	3.77	3.77	3.76	3.76	3.77	3.75	3.76	3.78	3.80	3.78

Table A.8 continued: ***Malenco serpentinite*** - *Antigorite analyses.*

sample	12 Ma20	13 Ma20	14 Ma20	15 Ma20	16 Ma20	17 Ma20	18 Ma20	19 Ma20	20 Ma20	21 Ma20	22 Ma20
SiO_2	43.99	43.75	44.05	44.57	44.14	43.83	43.86	43.37	43.21	43.41	43.94
TiO_2	0.02	0.02	0.00	0.02	0.00	0.01	0.03	0.00	0.00	0.01	0.01
Al_2O_3	0.47	0.54	0.46	0.32	0.38	0.47	0.46	0.57	0.53	0.50	0.45
FeO	2.00	2.40	2.16	1.61	1.61	2.12	2.21	2.97	3.29	2.81	2.23
MnO	0.06	0.10	0.06	0.07	0.08	0.01	0.04	0.11	0.10	0.09	0.02
MgO	40.18	39.87	40.59	39.30	39.63	40.42	40.45	40.35	41.61	40.32	40.16
CaO	0.03	0.03	0.03	0.04	0.04	0.01	0.01	0.05	0.03	0.04	0.03
Na_2O	0.01	0.03	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.00	0.01
K_2O	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Cr_2O_3	0.03	0.06	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.00
NiO	0.20	0.19	0.26	0.21	0.26	0.23	0.27	0.22	0.23	0.25	0.27
H_2O	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Total	98.99	98.98	99.60	98.15	98.15	99.08	99.36	99.65	101.01	99.43	99.13
	calculation based on 9 oxygens: all Fe=2+										
Si	2.08	2.07	2.07	2.11	2.09	2.07	2.07	2.05	2.02	2.05	2.07
Al	0.03	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Ti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe^{3+}	—	—	—	—	—	—	—	—	—	—	—
Fe^{2+}	0.08	0.09	0.09	0.06	0.06	0.08	0.09	0.12	0.13	0.11	0.09
Mg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mn	2.83	2.81	2.84	2.77	2.80	2.84	2.84	2.84	2.90	2.84	2.82
	2.94	2.95	2.97	2.87	2.90	2.96	2.97	3.00	3.07	2.99	2.95
Ca	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ni	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
OH	3.78	3.79	3.76	3.80	3.80	3.78	3.77	3.78	3.75	3.78	3.78

Table A.8 continued: ***Malenco serpentinite*** - *Antigorite analyses.*

sample	23 Ma20		24 Ma20		25 Ma20		26 Ma20		27 Ma20		28 Ma20		29 Ma20		30 Ma20		31 Ma20		32 Ma20		33 Ma20	
SiO_2	43.51		44.27		43.26		43.04		43.30		43.58		42.74		44.57		43.09		43.34		43.58	
TiO_2	0.00		0.08		0.02		0.03		0.00		0.04		0.02		0.02		0.07		0.02		0.03	
Al_2O_3	0.36		0.31		0.47		0.55		0.45		0.51		0.44		0.46		0.50		1.96		2.16	
FeO	3.09		1.67		3.11		2.82		2.84		2.21		3.64		1.74		3.31		3.33		3.28	
MnO	0.12		0.11		0.07		0.02		0.09		0.15		0.08		0.11		0.07		0.06		0.02	
MgO	40.74		38.23		41.16		41.19		41.65		39.95		41.08		40.71		41.02		39.44		38.82	
CaO	0.01		0.02		0.02		0.04		0.01		0.04		0.03		0.03		0.04		0.00		0.03	
Na_2O	0.00		0.02		0.01		0.01		0.00		0.00		0.00		0.01		0.01		0.00		0.00	
K_2O	0.00		0.01		0.00		0.00		0.01		0.02		0.00		0.00		0.01		0.01		0.00	
Cr_2O_3	0.02		0.00		0.05		0.03		0.07		0.25		0.00		0.14		0.03		0.46		0.80	
NiO	0.24		0.30		0.31		0.23		0.30		0.30		0.17		0.22		0.26		0.13		0.25	
H_2O	12.00		12.00		12.00		12.00		12.00		12.00		12.00		12.00		12.00		12.00		12.00	
Total	100.10		97.02		100.48		99.96		100.74		99.05		100.20		100.00		100.39		100.74		100.97	
	calculation based on 9 oxygens: all Fe=2+																					
Si	2.05		2.12		2.03		2.03		2.03		2.06		2.02		2.08		2.03		2.03		2.03	
Al	0.02		0.02		0.03		0.03		0.02		0.03		0.02		0.03		0.03		0.11		0.12	
Ti	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Fe^{3+}	—		—		—		—		—		—		—		—		—		—		—	
Fe^{2+}	0.12		0.07		0.12		0.11		0.11		0.09		0.14		0.07		0.13		0.13		0.13	
Mg	0.00		0.00		0.00		0.00		0.00		0.01		0.00		0.00		0.00		0.00		0.00	
Mn	2.86	3.01	2.73	2.83	2.88	3.05	2.89	3.05	2.90	3.06	2.82	2.96	2.89	3.07	2.83	2.95	2.87	3.05	2.75	3.01	2.70	2.99
Ca	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Na	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
K	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Cr	0.00		0.00		0.00		0.00		0.00		0.01		0.00		0.01		0.00		0.02		0.03	
Ni	0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.00		0.01	
OH	3.77		3.83		3.76		3.77		3.75		3.79		3.78		3.74		3.77		3.75		3.74	

Table A.8 continued: ***Malenco serpentinite*** - *Antigorite analyses.*

sample	34 Ma20		35 Ma20		36 Ma20		37 Ma20	
SiO_2	42.80		44.32		43.64		42.99	
TiO_2	0.06		0.02		0.01		0.02	
Al_2O_3	2.47		1.68		1.94		2.82	
FeO	3.93		3.05		3.45		4.57	
MnO	0.05		0.05		0.04		0.03	
MgO	38.42		39.31		39.17		38.44	
CaO	0.00		0.00		0.00		0.00	
Na_2O	0.00		0.00		0.00		0.00	
K_2O	0.00		0.00		0.02		0.01	
Cr_2O_3	0.86		0.21		0.56		0.38	
NiO	0.12		0.12		0.17		0.18	
H_2O	12.00		12.00		12.00		12.00	
Total	100.71		100.76		100.99		101.43	
calculation based on 9 oxygens: all Fe=2+								
Si	2.01		2.06		2.04		2.01	
Al	0.14		0.09		0.11		0.16	
Ti	0.00		0.00		0.00		0.00	
Fe^{3+}	—		—		—		—	
Fe^{2+}	0.15		0.12		0.13		0.18	
Mg	0.00		0.00		0.00		0.00	
Mn	2.69	3.02	2.73	2.95	2.72	3.00	2.67	3.03
Ca	0.00		0.00		0.00		0.00	
Na	0.00		0.00		0.00		0.00	
K	0.00		0.00		0.00		0.00	
Cr	0.03		0.01		0.02		0.01	
Ni	0.00		0.00		0.01		0.01	
OH	3.76		3.73		3.74		3.74	

Table A.9: ***Malenco serpentinite*** - *Pyroxene analyses.*

sample	1 Ma20		2 Ma20		3 Ma20		4 Ma20		5 Ma20	
SiO_2	55.89		56.00		54.67		54.92		54.04	
TiO_2	0.03		0.01		0.01		0.06		0.00	
Al_2O_3	0.01		0.00		0.93		0.73		1.45	
FeO	1.31		1.29		1.89		1.72		2.09	
MgO	0.03		0.05		0.05		0.06		0.04	
MnO	17.88		17.81		17.47		17.53		17.37	
CaO	26.64		26.51		25.26		25.72		24.78	
Na_2O	0.01		0.02		0.28		0.16		0.49	
K_2O	0.01		0.00		0.00		0.00		0.00	
Cr_2O_3	0.03		0.01		0.54		0.38		0.76	
NiO	0.05		0.04		0.05		0.05		0.00	
Total	101.88		101.74		101.15		101.33		101.03	
calculation based on 12 oxygens										
Si	3.99		4.00		3.94		3.95		3.90	
Al	0.00		0.00		0.08		0.06		0.12	
Ti	0.00		0.00		0.00		0.00		0.00	
Fe^{3+}	0.00		0.00		0.00		0.00		0.00	
Fe^{2+}	0.08		0.08		0.11		0.10		0.13	
Mg	0.00		0.00		0.00		0.00		0.00	
Mn	1.90	4.03	1.89	4.01	1.87	4.09	1.88	4.08	1.87	4.15
Ca	2.04		2.03		1.95		1.98		1.92	
Na	0.00		0.00		0.04		0.02		0.07	
K	0.00		0.00		0.00		0.00		0.00	
Cr	0.00		0.00		0.03		0.02		0.04	
Ni	0.00		0.00		0.00		0.00		0.00	

Table A.10: ***Malenco serpentinite*** - *Olivine analyses.*

sample	1 Ma	2 Ma	3 Ma	4 Ma	5 Ma	6 Ma	7 Ma	8 Ma	9 Ma	10 Ma	11 Ma
SiO_2	40.77	40.73	40.79	40.96	40.95	40.61	41.54	40.90	40.59	41.14	40.49
TiO_2	0.00	0.00	0.01	0.00	0.03	0.00	0.02	0.00	0.00	0.02	0.07
Al_2O_3	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.00	0.00	0.00	0.00
FeO	14.07	14.28	14.07	14.14	14.00	13.90	11.56	14.08	14.06	14.40	13.50
MnO	0.29	0.26	0.26	0.27	0.28	0.24	0.39	0.28	0.29	0.33	0.32
MgO	45.71	45.83	45.53	45.88	45.18	45.85	47.92	45.78	45.54	46.06	45.81
CaO	0.01	0.01	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.02	0.05
Na_2O	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
K_2O	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Cr_2O_3	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.04	0.01	0.03	0.00
NiO	0.35	0.39	0.37	0.37	0.37	0.34	0.14	0.34	0.39	0.35	0.35
Total	101.19	101.51	101.05	101.65	100.82	100.96	101.65	101.43	100.88	102.35	100.60
	calculation based on 4 oxygens										
Si	1.01	1.00	1.01	1.01	1.01	1.00	1.01	1.01	1.01	1.01	1.00
Al	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ti	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe^{3+}	-	-	-	-	-	-	-	-	-	-	-
Fe^{2+}	0.29	0.29	0.29	0.29	0.29	0.29	0.23	0.29	0.29	0.29	0.28
Mn	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Mg	1.68	1.68	1.68	1.68	1.67	1.69	1.73	1.68	1.68	1.68	1.69
	1.99	1.99	1.98	1.99	1.97	1.99	1.98	1.98	1.99	1.99	1.99
Ca	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ni	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01

Table A.10 continued: ***Malenco serpentinite*** - *Olivine analyses.*

sample	12 Ma		13 Ma		14 Ma		15 Ma		16 Ma		17 Ma		18 Ma		19 Ma		20 Ma	
SiO_2	38.83		34.25		41.06		40.65		40.95		40.75		41.30		36.67		36.54	
TiO_2	0.07		0.01		0.00		0.00		0.00		0.00		0.01		5.00		4.87	
Al_2O_3	0.07		0.08		0.01		0.01		0.00		0.01		0.00		0.00		0.00	
FeO	6.78		11.02		14.09		14.01		14.12		14.34		13.30		13.82		13.64	
MnO	0.39		0.35		0.28		0.30		0.30		0.26		0.47		0.29		0.30	
MgO	37.03		34.27		45.49		45.35		45.44		45.50		46.25		43.12		43.06	
CaO	0.39		0.22		0.00		0.00		0.01		0.00		0.00		0.00		0.00	
Na_2O	0.00		0.03		0.00		0.01		0.00		0.00		0.01		0.00		0.00	
K_2O	0.00		0.04		0.00		0.00		0.00		0.00		0.01		0.00		0.00	
Cr_2O_3	0.07		0.02		0.00		0.00		0.00		0.01		0.00		0.04		0.00	
NiO	0.00		0.33		0.36		0.42		0.44		0.39		0.34		0.30		0.30	
Total	83.62		80.61		101.28		100.75		101.27		101.26		101.68		99.26		98.72	
	calculation based on 4 oxygens																	
Si	1.11		1.06		1.01		1.01		1.01		1.01		1.01		0.93		0.93	
Al	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ti	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.10		0.09	
Fe^{3+}	-		-		-		-		-		-		-		-		-	
Fe^{2+}	0.16		0.28		0.29		0.29		0.29		0.30		0.27		0.29		0.29	
Mn	0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01	
Mg	1.58	1.77	1.57	1.89	1.67	1.98	1.68	1.98	1.67	1.98	1.68	1.99	1.69	1.98	1.64	2.04	1.64	2.04
Ca	0.01		0.01		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Na	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
K	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Cr	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Ni	0.00		0.01		0.01		0.01		0.01		0.01		0.01		0.01		0.01	

A.2 Determination of density and porosity

The density and porosity of the samples were determined by applying the Archimedean principle. Rock cores were vacuum-dried in the oven at 60 °C and weighed (m_{dry}). Subsequently, the cores were saturated with distilled water in an evacuated exxicator. After about 14 days the saturated samples were weighed again (m_{sat}). Additionally, their buoyancy was determined by hanging them into a cup of destilled water (m_{buoy}). The volume of the sample (V_{solid}) and of pores (V_{pore}), the density of the sample (ρ_s), and the porosity (ϕ_s) respectively, are derived from:

$$V_{solid} = \frac{m_{dry} - m_{buoy}}{\rho_{H_2O}}, \tag{A.1}$$

$$V_{pore} = \frac{m_{sat} - m_{dry}}{\rho_{H_2O}}, \tag{A.2}$$

$$\rho_{solid} = \frac{m_{dry}}{V_{solid}}, \tag{A.3}$$

$$\phi_{solid}[\%] = \frac{V_{pore}}{V_{solid}} \cdot 100. \tag{A.4}$$

The density of water was determined with a glass body of a defined volume (10 cm^3).

A.3 Determination of the loss of ignition

To estimate the amount of water released during the experiment, both the Chephren amphibolite and the Malenco serpentinite were subjected to the measurement of weight loss due to heat treatment. For this purpose, initially both materials were fine ground and weighed in a porcelain pot (m_i). Similar to the heat treatment during the ultrasonic experiments, the pots were heated then in 30 min and 60 min intervals in increments of 25 and 50 K, respectively, to a maximum temperature of 1000 °C at room pressure. After reaching the adjusted temperature the pots were weighed again (m_T):

$$\Delta m = m_T - m_i. \tag{A.5}$$

A.4 IR-spectoscopy

The water content of the amphibole phases was determined with infrared (IR) spectroscopy, which is sensitive especially for the detection of minor amounts of water in minerals and the differentiation between structurally bonded and molecular absorbed water. Infrared spectra were acquired from amphibole single crystals and amphibole single crystal powder, prepared from the starting material as well as of a sample, which was quenched from 870 MPa and 800 °C. The single crystals were prepared with polished coplanar faces parallel to the c-axes by the use of cleavage planes (Fig. A.1). The powder preparation was measured as a mixture of amphibole with KBr powder pressed to a tablet.

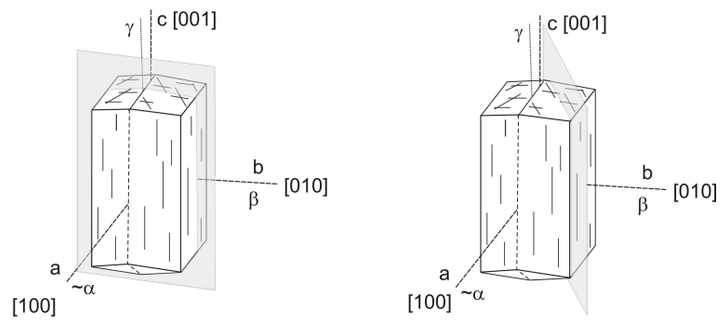

Figure A.1: *A hornblende crystal and its optical* α, β, γ *and crystallographic* **a, b, c** *axes. Single crystal preparations were oriented parallel to the c-axis and perpendicular to the a-axis by use of the predefined cleavage planes.*

The spectra were acquired with a Bruker FT-IR spectrometer (IFS66V) at a 2 cm^{-1} resolution using a globar light source and a KBr – beam-splitter. Spectra from single crystals were recorded with a MCT detector, while the measurements on KBr-tablets were done with a DTGS detector. Because of the arbitrary distribution of crystallites in the KBr-tablet the sample was analysed with non-polarised light. For single crystals additional IR spectra were taken in two or three orthogonal directions using a polarised beam. The spectra were analysed by using the PeakFit program (Jandel Scientific, v4.11).

The amphiboles seem to be extremely hygroscopic, thus displaying a combination of structurally bonded hydroxyl and, at lower energies, broad molecular water bands. To determine the amount of structurally bonded water in the amphiboles the integral peak area was corrected for the area of molecular water (peaks between 3200-3550 cm^{-1}). Following Libowitzky and Rossman [1997] and citations in it, the H concentration in minerals (Tab. A.11) is deduced from

$$c = \frac{A_i \cdot 1.8}{\rho \cdot t \cdot \varepsilon_i}, \tag{A.6}$$

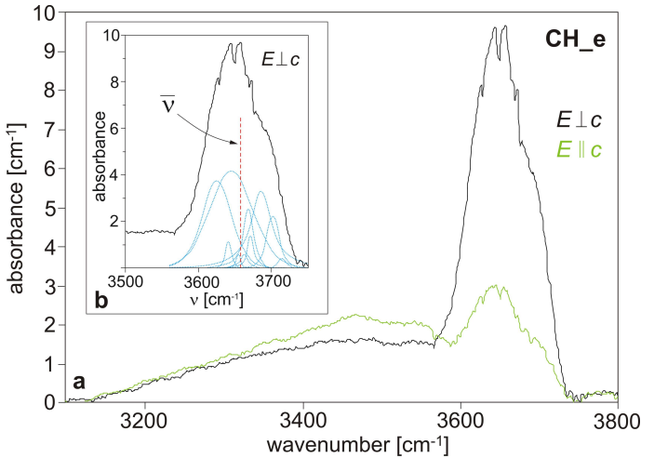

Figure A.2: *(a) Comparison of spectra of one single crystal of a fresh amphibole recorded perpendicular (black) and parallel to the c-axis (green). OH-groups are strongly polar and have thus a pronounced intensity perpendicular to the c-direction. (b) Close-up from diagram (a). Shown is the spectrum measured perpendicular to the c-direction. Additionally, the fitted peaks are plotted.*

where c is the H_2O content (in wt%), A_i is the integrated area of intensity (peak area), which is corrected for the peak area of molecular water, ρ is the density, t is the sample thickness and ε_i represents the integrated molar absorption coefficient, expressed in cm^{-2} per mol H_2O/l and can be calculated from

$$\varepsilon_i = 246.6\ (3753 - \overline{\nu}). \tag{A.7}$$

The weighted mean wavenumber $\overline{\nu}$ was determined for each spectra after

$$\overline{\nu} = \frac{\sum \nu_j \cdot A_{ij}}{\sum A_{ij}}. \tag{A.8}$$

For the starting material $\overline{\nu}$ was found to be constant with 3657.69 ± 0.82 cm^{-1}. The quenched sample shows a slightly lower mean wavenumber of 3655.41 ± 2.26 cm^{-1} (Tab. A.11).

The integrated peak area, A_i, of a spectrum recorded with non-polarised light displays the mean intensity over arbitrarily distributed crystals. Thus, only one spectrum is needed to calculate the H_2O content of the analysed sample. On the other hand, the integrated peak area of a single crystal spectrum, recorded with a polarised beam, reflects only the intensity of the hydroxyl bands in one direction. For this, the single crystal spectra of at least three directions had to be taken into account. As the intensities measured in any orientation parallel to the c-axis were tested to be quite similiar, a good approximation was to measure only one orientation parallel c, and the maximum peak area of the whole sample was calculated from $A_i = (A//c) + (A//c) + (A \perp c)$.

sample	beam	ρ [g/cm^3]	$\bar{\nu}$ [cm^{-1}]	ε_i [l mol^{-1}cm^{-2}]	A_i [cm^{-2}]	H_20 [ppm]	H_20 [wt%]
CH_b	pol	2.90	3657.69	23503.45	1423.00	3757.92	0.38
CH_b	non-pol	2.90	3657.69	23503.45	1248.00	3295.77	0.33
CH_c	pol	2.90	3657.69	23503.45	1358.94	3588.75	0.36
CH_d	pol	2.90	3657.69	23503.45	1284.26	3259.50	0.33
CH_e	pol	2.90	3657.69	23503.45	1392.59	3677.62	0.37
CH_e	non-pol	2.90	3657.69	23503.45	1292.72	3413.87	0.34
CH_KBr	non-pol	2.90	3654.00	24413.40	1583.26	4025.31	0.40
			Analyses of fresh amphiboles:			***mean***	***0.36 ± 0.03***
sample	**beam**	**ρ [g/cm^3]**	**$\bar{\nu}$ [cm^{-1}]**	**ε_i [l mol^{-1}cm^{-2}]**	**A_i [cm^{-2}]**	**H_20 [ppm]**	**H_20 [wt%]**
CHBnE_a	non-pol	2.90	3655.41	24065.69	1198.92	3079.25	0.31
CHBnE_a	pol	2.90	3655.41	24065.69	1128.71	2898.94	0.29
CHBnE_b	non-pol	2.90	3655.41	24065.69	1062.00	2727.59	0.27
CHBnE_b	pol	2.90	3655.41	24065.69	920.24	2363.51	0.24
CHBnE_c	non-pol	2.90	3655.41	24065.69	1326.49	3406.89	0.34
CHBnE_c	pol	2.90	3655.41	24065.69	1022.29	2625.62	0.26
CHBnE_d	non-pol	2.90	3655.41	24065.69	1412.08	3626.72	0.36
CHBnE_d	pol	2.90	3655.41	24065.69	1046.07	2686.68	0.27
			Analyses of quenched amphiboles:			***mean***	***0.29 ± 0.04***

Table A.11: *Water content determined on amphiboles from fresh Chephren amphibolite (CH) and a quenched sample (CHBnE). Samples were measured with polarised* ***(pol)*** *and non-polarised (****non-pol****) light, respectively. The errors are given in terms of standard deviation.*

A.5 Electron Backscatter Diffraction

EBSD is a Scanning Electron Microscopy (SEM) method based on Bragg's law, defining each particle of an atomic layer of a crystal as a scattering centre, thus acting as a point source of secondary spherical wave fronts. A constructive interference of these wave fronts is only accomplished if the retardation of waves, reflected on lattice planes with the distance d_{hkl} and an angle of incidence θ, corresponds to an integer multiple n of the wavelength λ (Fig. A.3).

$$n \cdot \lambda = 2 d_{hkl} \cdot sin\theta \tag{A.9}$$

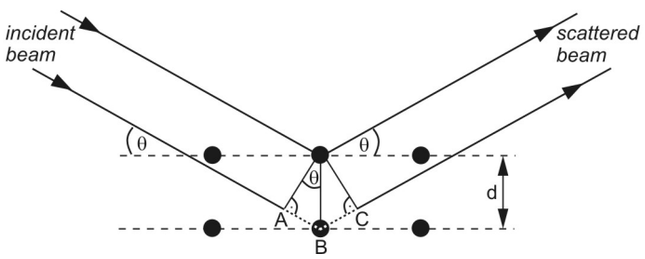

Figure A.3: *Schematic illustration of Bragg's law. Two rays of the incident electron beam, in phase and parallel, are scattered by atoms of different lattice planes. The beam, which strikes the lower layer has to travel an extra distance AB-BC. To satisfy Bragg's law this distance must be equal to an integer multiple n of the wavelength* λ.

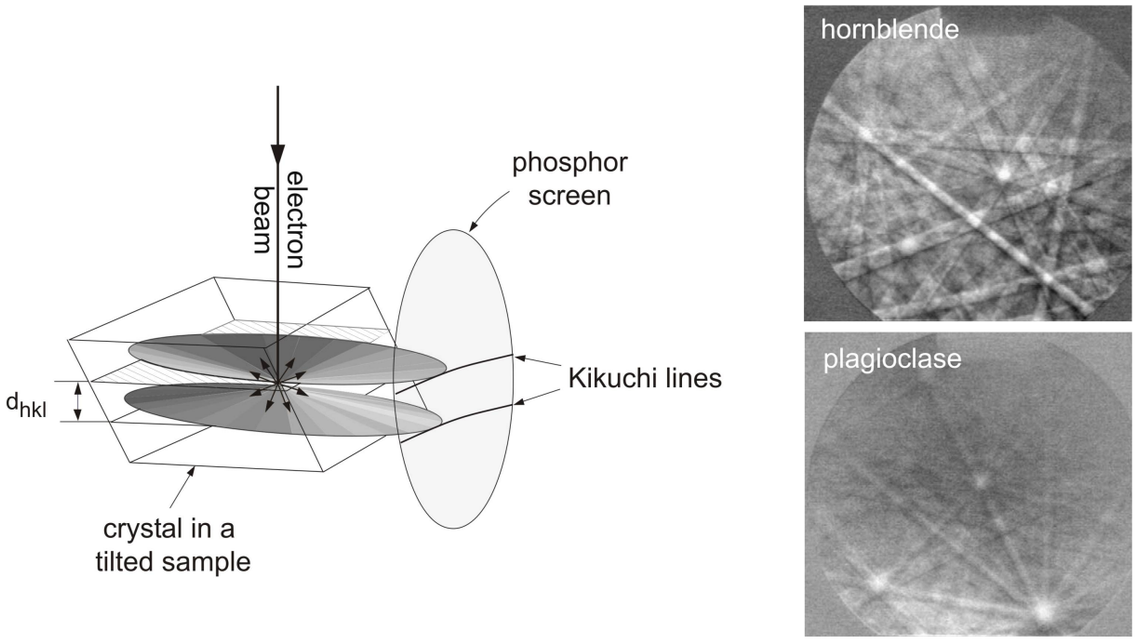

Figure A.4: *The generation of a Kikuchi band (schematic). The reflection of an electron beam on lattice planes results in the generation of a number of Kikuchi bands, which overlap and form complex patterns. On the right recorded EBSD patterns of hornblende and plagioclase are shown.*

Only few angles θ satisfy Bragg's law and lead to the diffraction of an inelastic scattered electron beam at a given wavelength. Therefore, to obey the Bragg conditions, a highly polished thin-section is inclined about 70° to a vertical incident electron beam with a high aperture and an accelerating voltage of 15 kV. In this case, on either side of the diffraction (reflection) plane, back-scattered electrons emerge along two flat cones of high electron intensity. The edges of these cones are imaged on a phosphor screen and appear as a complex pattern of intersecting Kikuchi bands (Fig. A.4). Every band corresponds to a certain lattice plane crystallographic orientation of the minerals. The EBSD images are collected with a low light CCD camera and automatically indexed by comparing the observed pattern of Kikuchi-bands with those simulated for pre-defined crystallographic structures [Lloyd et al., 1991; Adams et al., 1993; Dingley and Field, 1997]. For indexation the CHANNEL+ software was used [Schmidt & Olesen, 1989], which is based on determination of the Euler angles (φ_1, ϕ, φ_2) of the lattice orientation. The relative precision of the determination of the Euler angles is better than 1° [Krieger Lassen, 1996].