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Experimental evidence for fluid-induced melting in subduction zones

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Supplementary Information

The Supplementary Information includes:

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Starting Materials and Methods

Starting Materials

Two glasses with K-free average MORB composition were synthesised at 1600 ˚C. The first one (MORB1) was prepared without trace elements and was used in the reversed experiments. For some forward experiments, part of MORB1 was mixed with 2 wt. % of a synthetic diopside glass (D1) which was doped with 25 trace elements in order to give the final bulk concentrations reported in Supplementary Table S-2 (MORB1-2D1). A second basaltic glass (MORB2) with similar major element composition but directly doped with LILE was also synthesised. The remaining trace elements were added by mixing 2 wt. % of a second synthetic diopside glass (D2) to MORB2 (MORB2-2D2). In experiment PC23, a starting material prepared by mixing MORB2 with 0.4 wt. % of D1 (MORB2-DD1) was used. To each solid starting material, 1 wt. % of natural garnet seeds selected and crushed from Grytting (Norway) eclogite were added to enhance garnet growth during the experiments. Solutions with 1, 5, 10, or 15 wt. % salinity were prepared by adding pure NaCl to distilled water. For the trace element doped solutions used in the reversed experiments, equal amounts of a certified ICP standard solution for each individual trace element (1000 ppm of trace element in 5 % HNO_3) were mixed and evaporated under an infrared lamp. The solid residue was subsequently dissolved in a smaller amount of 5 % HNO_3 to obtain higher trace element concentrations and the resulting milky solution was left to rest for 1 month. After the deposition of the insoluble residue, the clear solution at the top was separated. The compositions from ICP-MS analyses of the two different doped solutions obtained with this procedure are given in Table S-2 (SOL1 and SOL2).

Experiments

For each experiment, some of the solution was pipetted into a Pt or Au capsule (5 mm outer diameter, 10 mm long, 0.2 mm wall thickness), then a layer of MORB glass powder (~ 55 mg) was added, followed by a layer of diamond powder (with 10-20 µm grain diameter). The remaining fluid was added after the diamonds to avoid suspending the first layer of basaltic starting material, which could contaminate the diamond trap. At last, another layer of MORB glass was added. The resulting total fluid/glass weight ratio ranged from 0.30 to 0.45. The capsule was weighed before and after welding of the top lid to assure that no water loss occurred. Each capsule was also left overnight in an oven at 130 ˚C and weighed again to verify the sealing before the experiment. High pressure experiments were carried out at 4 GPa and 800 ˚C in an end-loaded piston cylinder apparatus using ½ inch MgO-NaCl assemblies with a stepped graphite furnace. Temperature was measured with a S-type (Pt/Pt-Rh) thermocouple and monitored by a Eurotherm controller. Long compression and decompression times (16-20 hours) were used to reduce capsule deformation. Temperature was raised at constant pressure after compression with a rate of 100 ˚C/min. In some experiments, a temperature fluctuation of ± 30 ˚C was applied after an initial equilibration at constant temperature for ~ 36 hours to nucleate the stable mineral assemblage. The temperature cycling was terminated ~24 hours before quenching to allow final equilibration. During temperature cycling, linear ramps in temperature (from 770 to 830 ˚C and back) lasted 2 hours each, with dwelling times at both temperatures of 2 hours; a single temperature cycle lasted in total 8 hours. The duration of the experiments at combined high pressure and high temperature was 2-7 days. Oxygen fugacity was not controlled, but probably was near the Ni-NiO buffer. The runs were quenched by shutting off the power at constant pressure before starting decompression.

Analytics

After the experiments, the retrieved capsules were immediately cooled in liquid nitrogen and then stored in a freezer at -18 °C until the day of the analysis. On that day, each capsule was taken out of the freezer, cooled further to -50 to -100 °C, and then cut longitudinally in half with a razor blade attached to an opening device. One half of the frozen capsule was then quickly transferred to a Laser-Ablation Inductively-Coupled-Plasma Mass-Spectrometry (LA-ICP-MS) sample chamber equipped with a Peltier-cooling element to keep the sample frozen during the entire measurement. Tests with H_2O-ethanol mixtures revealed that the temperature in this sample chamber was *ca*. -30 °C. Analysing the diamond trap in frozen state is necessary to avoid element fractionation during solution evaporation, which would introduce major uncertainties in the quantification procedure. The LA-ICP-MS measurements were performed with a 193 nm ArF GeolasPro laser ablation unit (Coherent, USA) connected to a Elan DRC-e quadrupole ICP-MS unit (Perkin Elmer, Canada). The sample chamber was flushed with He at a flow rate of 0.4 l/min, to which 5 ml/min H_2 was admixed on the way to the ICP-MS. Measured isotopes included ^{7}Li, ^{9}Be, ^{11}B, ^{23}Na, ^{25}Mg, ^{27}Al, ^{30}Si, ^{35}Cl, ^{43}Ca, ^{45}Sc, ^{49}Ti, ^{57}Fe, ^{85}Rb, ^{88}Sr, ^{89}Y, ^{90}Zr, ^{93}Nb, ^{133}Cs, ^{137}Ba, ^{139}La, ^{140}Ce, ^{146}Nd, ^{147}Sm, ^{153}Eu, ^{157}Gd, ^{163}Dy, ^{167}Er, ^{172}Yb, ^{175}Lu, ^{178}Hf, ^{181}Ta, ^{208}Pb, ^{232}Th, and ^{238}U, using a dwell time of 10 ms. The ICP-MS was tuned to a thorium oxide production rate of 0.05-0.10 % and a rate of doubly charged Ca ions of 0.15-0.25 % based on measurements on NIST SRM 610 glass (Jochum *et al*., 2011). The diamond trap layer was analysed by moving the laser beam at constant velocity along two perpendicular transects (parallel and perpendicular to the diamond layer, see Fig. 1a) using a laser spot size of 50-70 μm and a repetition rate of 7 Hz. The signals resulting from each transect (Fig. 1c) were divided into 3-4 separate integration intervals, for which element concentrations were calculated. The NIST SRM 610 glass and a well-characterised, natural afghanite crystal (Seo *et al*., 2011) were used as external standards. Chlorine (or Cs in experiments conducted with pure water) was used as internal standard, because these elements are expected to partition strongly into the fluid in the K-free eclogite-water system at the experimental conditions. Indeed, chlorine was never detected in any of the crystalline phases. Chlorine contents in the fluid phase were corrected for the dilution effect by dissolved solutes (mostly SiO_2), as determined from the diamond trap analyses. After analysis of the diamond trap, the capsules were left to evaporate at room temperature and subsequently were impregnated with epoxy resin and were polished to expose minerals for LA-ICP-MS measurements. The largest suitable spot sizes to analyse single crystals and the rims in zoned garnets were chosen, usually in the range of 7-20 μm. Averages obtained from measurements of 4 to 7 separate crystals within the capsule were used to calculate the compositions of garnet (Supplementary Table S-5), omphacite (Table S-6) and rutile (Table S-7). Special care was taken in the garnet measurements to only analyse inclusion-free rim portions and to avoid the natural garnet seeds, which showed distinctively different composition. To calculate bulk fluid/eclogite partition coefficients, first the fluid/mineral partition coefficients for each mineral were calculated, and then the results normalised to a representative eclogitic composition of 59 % omphacite, 39 % garnet and 2 % rutile.

Major element compositions of minerals were also measured by electron microprobe. A JEOL JXA 8200 instrument was used with a focused beam, an acceleration voltage of 15kV, a beam current 15nA and counting times of 10 sec on the background and 20 sec on the peak. The following standards were used: Diopside for Si, Mg, Ca; $MnTiO_3$ for Ti; Fe_2O_3 for Fe, albite for Na; corundum for Al.

Supplementary Discussion

Phase Assemblage in Experiments and in Natural MORB Eclogites

The starting material used in the experiments was designed to be very similar to that of the study of Kessel *et al*. (2005) in order to facilitate the comparison of the Cl-free experiments. In particular, as in the study of Kessel *et al*. (2005), the simplified MORB composition used did not contain any phosphorus or potassium. This is well justified, since both P (0.184 wt. % P_2O_5) and K (0.160 wt. % K_2O) concentrations in natural MORB are very low (Gale *et al.*, 2013). Natural eclogites occasionally contain apatite and phengite, which could be important hosts for certain trace elements (REE in apatite, alkalis and Ba in phengite). However, we argue here that due to the low P and K contents of MORB, these phases will either not occur at all or only occur in insignificant traces in eclogites of MORB composition.

Konzett and Frost (2009) measured the solubility of phosphorus in garnet of MORB eclogite. They observed a solubility of P_2O_5 in the garnet phase of about 0.3 wt. % at 4 GPa. They therefore concluded that virtually all P in a MORB eclogite will be contained in garnet. If apatite is observed in MORB eclogites, it is often a secondary alteration product, *e.g.*, formed by low-temperature exsolution from garnet. This effect was already observed by Fung and Haggerty (1995); see also Keller and Ague (2019). Moreover, we note that in the presence of NaCl, apatite becomes quite soluble in aqueous fluids (Mair *et al.*, 2017), such that traces of apatite would readily be dissolved during dehydration of the basaltic crust.

The low average K_2O content of 0.16 wt. % limits the amount of phengite that may form in an eclogite of MORB composition. Therefore, typical MORB eclogites either contain no (primary) phengite at all or at most traces of this mineral. In the classical eclogite occurrences of the Bohemian Massif in central Europe, Okrusch *et al.* (1991) distinguished three lithological types, two of which do not contain any phengite. Similar, phengite-free eclogites of MORB composition were also described by Heinrich (1982), Tubia and Ibarguchi (1991), and Imayama *et al.* (2017). Eclogites from the North Dulan Belt in China, which formed from N-type and E-type MORB may or may not contain phengite; however, in every case the modal abundance is less than 1 % (Song *et al.*, 2003). Very likely, the occurrence of phengite is limited to the more K-enriched E-MORB types. Finally, we note that during interaction with an aqueous fluid, K will partition into the fluid, which should destabilise any traces of phengite.

Silica Content of Starting Materials

The silica content of the solid starting material (54 – 55 wt. %, Table S-2) is higher than in average MORB (50.47 wt. %, Gale *et al.*, 2013). This, however, compensates for the effect that in our experiments, the fluid/solid ratio is 0.3 – 0.5 and therefore much higher than in nature. These high fluid/solid ratios are necessary in order to be able to trap sufficient fluid in the diamond layer for analysis. Silica preferentially partitions into the fluid and is the most abundant solute in the aqueous phase (*e.g.*, Kessel *et al.*, 2005). This has the effect of shifting the composition of the solid residue back to that of MORB. Indeed, our experiments produce a typical eclogite phase assemblage (Fig. 1, main text) without any excess quartz or coesite.

Comparison of Trace Element Ratios in Primitive Arc Basalts With Those Observed in Experiments

Certain trace element ratios are considered to be particularly characteristic for subduction zone magmas; this includes in particular high Ba/Nb (*e.g.*, Pearce *et al.*, 2005), Ba/La (*e.g.*, Rüpke *et al.*, 2002), and U/Th ratios (*e.g.*, Bali *et al.*, 2011). Here, we compare these ratios in natural, primitive arc basalts with those predicted by our experimental data. Average primitive arc basalt compositions for 14 different subduction zones were taken from the compilation in Kelemen and Hanghøj (2005). Fluid compositions released from the basaltic oceanic crust were obtained by assuming average MORB composition for the crust (Gale *et al.*, 2013) and very low fluid/solid ratios. In this limiting case, the concentration ratio of two elements X and Y in the fluid may be estimated from the equation

$$c_X^{\mathrm{fluid}}/c_Y^{\mathrm{fluid}} = (c_X^{\mathrm{MORB}}/c_Y^{\mathrm{MORB}})\ (D_X^{\mathrm{fluid/eclogite}}/D_Y^{\mathrm{fluid/eclogite}})$$

These element ratios are directly given as ppm/ppm ratios; they are not normalised to MORB compositions. For Ba/Nb, the data compiled by Kelemen *et al.* (2005) span a range from 47 to 352. For fluid salinities with > 4 wt. % Cl (experiments PC27, PC36, and PC39, Table S-8), the predicted Ba/Nb ratios in the fluid range from 1280 to 3201. This means that already a small addition of such a fluid to the source of melting may produce the observed high Ba/Nb ratios. For Ba/La, the situation is similar. In average primitive arc basalts, this ratio ranges from 13 to 48, the ratio calculated for the fluid in the same three experiments as above is between 18 and 605. U/Th ratios in arc basalts are usually higher than in MORB (0.29); the average data by Kelemen *et al.* (2005) suggest a range from 0.11 to 0.65. In the fluids, the calculated ratio is between 3.1 and 5.0, indicating again that already a minor fluid addition to the source of melting will shift the ratio into the right direction. For the U/Th data, however, it has to be considered that U solubility in fluids increases with oxygen fugacity (Bali *et al.*, 2011). Oxygen fugacity in our experiments was not buffered, but is likely close to the Ni-NiO buffer. For a quantitative discussion of the effect of oxygen fugacity on U/Th ratios in subduction zone fluids, see Bali *et al*. (2011).

Supplementary Tables

Table S-1 Summary of experiments.

Experiment	NaCl in Fluid (wt. %)	Doped Fluid	Solid Starting Material	Capsule Material	Duration (h)	Temperature Fluctuations
PC09	0	-	MORB1-2D1	Au	84	no
PC22	0	-	MORB1-2D1	Pt	120	no
PC37	0	-	MORB2-2D2	Pt	68	yes
PC38	0	-	MORB2-2D2	Pt	128	no
PC14	1	-	MORB1-2D1	Au	69	no
PC23	5	-	MORB2-DD1	Pt	163	yes
PC10	10	-	MORB1-2D1	Au	68	no
PC25	10	-	MORB2-2D2	Pt	102	yes
PC27	10	-	MORB2-2D2	Pt	93	yes
PC36	15	-	MORB2-2D2	Pt	103	yes
PC39	15	-	MORB2-2D2	Pt	126	yes
PC15	15	-	MORB1-2D1	Au	63	no
PC24*	0	SOL1	MORB1	Pt	144	yes
PC18*	10	SOL2	MORB1	Pt	52	no

* reversed experiments

Table S-2 Starting material.

		MORB1	MORB1-2D1	MORB2-2D2	MORB2-DD1	SOL1	SOL2
Major elements (wt. %)	SiO_2	54.04 (18)	53.79 (19)	55.62 (17)	55.78 (15)		
	Al_2O_3	17.38 (6)	17.04 (6)	17.26 (12)	17.54 (11)		
	MgO	5.56 (3)	5.73 (3)	5.41 (3)	5.27 (2)		
	CaO	9.52 (2)	9.75 (2)	8.88 (8)	8.66 (8)		
	FeO	8.30 (12)	8.14 (13)	6.93 (5)	7.04 (6)		
	Na_2O	3.90 (2)	3.83 (3)	3.77 (9)	3.83 (8)		
Trace elements (ppm)	Li		236 (2)	1029 (16)	1076 (15)		100
	Be		192 (1)	1000 (11)	1040 (10)	202	100
	B		45 (1)	495 (16)	266 (15)	159	74
	Rb		61 (1)	777 (16)	728 (16)		99
	Cs		6.2 (1)	1077 (16)	1079 (15)	198	95
	Sr		254 (2)	1068 (7)	877 (8)	178	98
	Ba		456 (2)	1092 (4)	1145 (5)	180	98
	Ti	7718 (18)	7565 (20)	7011 (117)	7124 (115)		
	Nb		138 (1)	77.4 (6)	30.7 (2)	103	17
	Ta		75 (1)	82.0 (9)	15.2 (2)	104	8
	Zr		119 (1)	37.8 (3)	33.1 (2)	188	96
	Hf		121 (1)	38.9 (4)	24.5 (2)	186	98
	La		208 (2)	211 (2)	41.8 (4)	142	99
	Ce		818 (5)	519 (3)	562 (4)	146	99
	Nd		222 (1)	221 (2)	44.0 (2)	154	99
	Sm		215 (2)	224 (1)	42.3 (3)	164	99
	Eu		217 (2)	223 (2)	45.9 (5)	166	99
	Gd		239 (2)	248 (1)	47.2 (4)	168	98
	Dy		245 (2)	243 (3)	48.7 (5)	175	98
	Er		240 (2)	310 (4)	47.4 (4)	177	98
	Yb		241 (2)	296 (3)	47.6 (4)	174	98
	Lu		248 (3)	243 (3)	49.5 (6)	177	98
	Y		250 (3)	36.7 (3)	50.5 (7)	161	98
	Sc			261 (5)			
	Pb		92.5 (4)	530 (5)	21.1 (9)	189	97
	Th		198 (3)	106 (1)	39.4 (7)	117	26
	U		275 (2)	134 (1)	54.9 (4)	195	97

Numbers in parentheses are one standard deviation in the last digits. Total iron is given as FeO.

Table S-3 Microprobe analyses of garnet and omphacite (in wt. %).

Garnet									
SiO_2	39.17	39.32	39.86	39.43	39.25	38.77	39.02	39.19	39.26
TiO_2	0.69	0.69	0.71	0.64	0.63	0.89	0.79	0.63	0.74
Al_2O_3	22.00	21.53	21.91	21.93	21.67	20.83	21.33	21.47	20.80
MgO	7.35	7.46	7.36	7.15	7.17	7.29	6.66	8.18	6.69
CaO	11.37	10.82	10.74	10.76	10.18	9.85	11.32	8.50	10.89
FeO	20.04	20.83	21.08	20.57	21.60	22.27	21.21	22.14	21.80
Na_2O	0.06	0.06	0.05	0.09	0.06	0.07	0.09	0.06	0.21
Total	100.7	100.7	101.7	100.6	100.6	100.0	100.4	100.2	100.4

Omphacite					
SiO_2	54.57	54.69	55.81	53.81	53.53
TiO_2	0.28	0.21	0.13	0.49	0.84
Al_2O_3	12.23	12.61	10.20	10.50	10.62
MgO	7.80	8.30	9.77	8.90	8.23
CaO	12.91	12.78	14.76	13.55	13.83
FeO	4.13	3.05	5.18	7.64	6.90
Na_2O	6.01	6.52	5.81	5.46	5.90
Total	97.9	98.1	101.6	100.3	99.8

Garnet and omphacite compositions were measured on grains across the capsule in one single experiment (PC09). The average garnet composition is $(Ca_{0.29}Mg_{0.27}Fe_{0.44})_3(Al_{0.97}Fe_{0.03})_2(SiO_4)_3$, the average pyroxene composition is $Ca_{0.52}Na_{0.41}Mg_{0.46}Fe_{0.16}Al_{0.44}Si_{1.96}O_6$

Table S-4 Fluid compositions.

Experiment	PC09	PC22	PC37	PC38	PC14	PC23	PC10	PC25	PC27	PC36	PC39	PC15	PC24*	PC18*
Cl (wt. %)	0	0	0	0	0.48	2.25	3.76	3.85	4.91	6.50	6.81	6.93	0	4.23
Li	147 (8)	51.5 (9)	1172 (25)	1044 (11)	286 (15)	1322(109)	314 (14)	1468 (10)	999 (4)	987 (22)	756 (38)	564 (38)	21.6 (14)	54.1 (7)
Be	50 (3)	22.5 (3)	604 (8)	531 (9)	137 (2)	455 (32)	191 (16)	744 (4)	712 (55)	462 (14)	383 (44)	404 (29)	20.3 (16)	106 (3)
B	731 (43)	29.6 (7)	1120 (18)	1046 (14)	282 (10)	1000 (106)	2094 (224)	3668 (67)	2224 (67)	4097 (145)	2234 (201)	259 (17)	80 (5)	440 (6)
Rb	213 (9)	41.3 (3)	1529 (15)	1544 (11)	670 (42)	2266 (180)	710 (51)	5112 (89)	3089 (38)	5671 (196)	2772 (194)	394 (32)	100 (8)	314 (5)
Cs	17.0 (7)	19.3 (1)	2105 (20)	2076 (15)	51 (1)	4725 (431)	81 (6)	9912 (38)	17895 (1467)	7631 (215)	6312 (485)	125 (14)	86 (8)	427 (67)
Sr	194 (8)	90 (2)	1155 (42)	849 (15)	832 (58)	1356 (64)	396 (47)	1914 (365)	2945 (38)	2236 (167)	1235 (97)	1212 (87)	57 (5)	424 (8)
Ba	254 (23)	157 (2)	1606 (16)	1375 (22)	1285 (130)	1885 (135)	1074 (106)	2314 (4)	4542 (69)	4618 (454)	1441 (84)	2384 (173)	275 (23)	1785 (23)
Ti	162 (10)	74 (3)	387 (4)	331 (7)	280 (24)	435 (56)	414 (64)	702 (5)	272 (21)	481 (25)	367 (68)	254 (24)	133 (16)	376 (23)
Nb	10.9 (7)	4.44 (4)	17.8 (3)	14.3 (1)	19.0 (8)	4.23 (4)	27 (2)	22.7 (4)	8.5 (7)	23.3 (7)	11.7 (13)	17 (4)	0.74 (5)	3.18 (16)
Ta	0.9 (1)	0.41 (2)	3.3 (1)	2.48 (8)	2.07(14)	0.32 (1)	1.5 (2)	3.47 (2)	1.69 (5)	2.73 (12)	1.9 (3)	2.5 (2)	0.09 (2)	0.84 (14)
La	0.23 (2)	0.18 (1)	0.51 (1)	0.39 (5)	1.5 (6)	0.7 (1)	5.8 (7)	2.62 (13)	5.32 (13)	8.4 (9)	6.9 (17)	43 (2)	5.0 (4)	12.1 (6)
Ce	2.6 (2)	1.5 (2)	2.94 (7)	2.39 (14)	10 (3)	29 (5)	41 (6)	14.5 (6)	20 (1)	29.3 (18)	23 (4)	169 (7)	66 (4)	129 (6)
Nd	0.27 (3)	0.226 (4)	0.60 (3)	0.47 (4)	1.9 (8)	0.86 (10)	5.5 (3)	2.9 (4)	6.3 (4)	7.6 (11)	4.8 (11)	31.3 (17)	4.6 (4)	10.9 (6)
Sm	0.50 (5)	0.287 (8)	0.86 (4)	0.62 (2)	1.9 (6)	0.78 (7)	5.1 (11)	3.6 (5)	6.2 (4)	9.2 (13)	5.4 (8)	26.3 (17)	3.9 (3)	10.3 (3)
Eu	1.0 (1)	0.565 (5)	1.83 (3)	1.42 (3)	3.6 (1)	1.67 (23)	11.3 (13)	7.2 (9)	14.6 (9)	25 (3)	22 (5)	100 (7)	4.2 (3)	13.6 (4)
Gd	1.1 (2)	0.420 (9)	1.06 (4)	0.72 (3)	2.1 (4)	0.81 (4)	4.9 (4)	4.2 (5)	5.5 (3)	11.3 (16)	4.7 (5)	20.8 (5)	2.6 (2)	6.6 (3)
Dy	1.9 (3)	0.63 (4)	1.30 (9)	0.90 (5)	1.7 (3)	0.75 (3)	3.7 (2)	4.4 (4)	2.96 (13)	10.0 (11)	3.38 (16)	10.2 (3)	1.35 (9)	3.8 (3)
Er	1.7 (3)	0.59 (6)	1.37 (12)	0.88 (9)	1.2 (2)	0.52 (5)	2.4 (3)	4.8 (6)	1.98 (13)	8.1 (8)	3.3 (5)	6.0 (2)	1.05 (13)	4.8 (5)
Yb	1.5 (2)	0.63 (5)	1.35 (13)	0.99 (14)	1.4 (2)	0.53 (4)	2.2 (2)	5.3 (7)	2.22 (13)	6.2 (7)	4.0 (7)	5.8 (6)	1.4 (3)	7.6 (11)
Lu	1.3 (2)	0.55 (5)	0.9 (1)	0.68 (9)	1.5 (2)	0.47 (5)	1.8 (3)	4.7 (6)	1.54 (19)	4.1 (3)	3.3 (6)	5.8 (3)	1.2 (2)	9.0 (14)
Y	13 (3)	3.7 (4)	9 (2)	6.7 (17)	20 (5)	5.0 (7)	20 (4)	19 (3)	19 (3)	23 (6)	10.6 (17)	64 (20)	5.5 (6)	28 (8)
Sc			3.3 (2)	2.66 (12)				8.4 (2)	3.00 (16)	5.5 (3)	4.4 (6)			
Pb	108 (21)	17.3 (5)	371 (3)	228 (1)	177 (6)	13 (1)	589 (67)	1708 (96)	860 (109)	1428 (110)	1008 (164)	417 (28)	21.7 (11)	438 (9)
Th	0.19 (2)	0.0497 (8)	0,16 (2)	0.116 (12)	0.9 (5)	0.35 (5)	0.67 (9)	0.52 (1)	0.45 (2)	0.71 (4)	0.55 (9)	6.2 (2)	0.81 (5)	1.62 (15)
U	14 (2)	5.0 (3)	11.7 (12)	9.2 (6)	29 (2)	13.7 (16)	58 (7)	50 (2)	20 (2)	63.8 (22)	36 (6)	158 (7)	12.2 (19)	134 (13)

All compositions are given in ppm by weight, except for Cl (wt.%). Numbers in parentheses are one standard deviation in the last digits. * reversed experiments

Table S-5 Garnet compositions.

Experiment	PC09	PC22	PC37	PC38	PC14	PC23	PC10	PC25	PC27	PC36	PC39	PC15	PC24*	PC18*
Cl (wt.%) **	0	0	0	0	0.48	2.25	3.76	3.85	4.91	6.50	6.81	6.93	0	4.23
Li	< 57	22 (3)	144 (9)	113 (10)	< 188	162 (41)	< 32	112 (26)	270 (66)	76 (12)	66 (10)	124 (23)	< 39	< 69
Be	< 81	< 70	91 (28)	68 (10)	< 35	127 (32)	< 88	111 (5)	160 (37)	57 (12)	35 (3)	< 162	< 101	< 127
B	< 71	< 79	96 (11)	123 (8)	< 528	26 (1)	< 63	81 (2)	44 (2)	84 (11)	51 (6)	< 110	< 74	< 89
Rb	< 4.9	1.11 (18)	13 (9)	3.6 (5)	< 25	2.7 (7)	< 3.00	2.94 (16)	29 (12)	3.6 (0.9)	1.7 (2)	< 4.84	< 2.98	< 4.1
Cs	< 1.46	< 47	15 (11)	3.4 (5)	< 8.35	3.1 (7)	< 1.30	1.57 (12)	28 (10)	3.9 (1.6)	1.4 (2)	< 1.97	< 0.546	< 3.1
Sr	2.92 (5)	< 1.78	38 (7)	25 (6)	14 (4)	18.7 (6)	2.2 (13)	7.3 (4)	61 (11)	21 (12)	9.2 (28)	7.0 (23)	5 (1)	3.51 (14)
Ba	9.9	< 3.38	22 (12)	14 (5)	< 45.4	6.0 (5)	< 7.00	5.50 (7)	46 (29)	15 (7)	9.0 (17)	< 16	< 6.3	< 16.5
Ti	5295 (657)	4545 (517)	4251 (702)	3955 (247)	6038 (1376)	5002 (539)	5540 (521)	2998 (432)	5168 (514)	4122 (2160)	2031 (417)	4234 (372)	4486 (224)	2877 (465)
Nb	28 (3)	28 (3)	9.4 (23)	9 (3)	50 (19)	6.1 (25)	33 (7)	11 (6)	29 (3)	31 (18)	5.0 (18)	9.6 (12)	2.4 (2)	3.1 (0.4)
Ta	12.1 (18)	13 (2)	8 (3)	7.5 (23)	22 (9)	1.6 (3)	17 (5)	11 (7)	27 (3)	31 (20)	4.7 (16)	5.7 (16)	1.7 (4)	< 2.70
Zr	80 (1)	74 (6)	106 (10)	101 (9)	76 (4)	86.9 (5)	93.9 (5)	88 (3)	63 (11)	82 (17)	67 (5)	60 (4)	74 (3)	61 (3)
Hf	33 (3)	40 (2)	36 (4)	33 (4)	41 (2)	17 (3)	54 (4)	26 (2)	32 (5)	32 (7)	23 (2)	43 (4)	19 (3)	22.9 (13)
La	< 1.02	0.65 (4)	5.5 (13)	5.7 (17)	12 (2)	0.52 (8)	< 1.13	1.4 (3)	13 (3)	2.0 (0.8)	1.6 (5)	12 (5)	4.7 (1)	< 1.54
Ce	13.1 (4)	7.1 (3)	41 (9)	27 (8)	49 (28)	36 (2)	7.4 (24)	5.0 (14)	56 (12)	9 (4)	5.0 (13)	87 (29)	74 (19)	11 (5)
Nd	< 6.42	3.5 (3)	8 (2)	8.6 (11)	< 27.3	2.1 (4)	6.6 (6)	4.9 (7)	19 (3)	11 (3)	4.7 (6)	21 (5)	8.8 (4)	< 10.8
Sm	20.7 (49)	14 (3)	34 (6)	28 (4)	36 (2)	7.8 (2)	< 21.7	36 (5)	70 (7)	67 (16)	30 (3)	119 (7)	34 (4)	17.87 (8)
Eu	46 (11)	37 (7)	77 (10)	66 (7)	66 (15)	15.2 (13)	68 (1)	82 (10)	151 (14)	141 (33)	72 (9)	205 (8)	55 (8)	47 (4)
Gd	84 (16)	65 (12)	116 (17)	105 (10)	115 (27)	18 (3)	117 (9)	134 (16)	249 (25)	204 (48)	115 (15)	254 (26)	74 (10)	45 (3)
Dy	237 (6)	223 (26)	294 (35)	291 (18)	229 (10)	44 (2)	260 (7)	435 (23)	538 (56)	473 (89)	382 (52)	423 (35)	106 (26)	58 (2)
Er	361 (43)	450 (59)	529 (52)	532 (28)	362 (40)	62 (9)	340 (18)	930 (131)	781 (103)	818 (182)	872 (117)	430 (52)	106 (32)	63 (3)
Yb	470 (121)	705 (115)	608 (48)	594 (48)	527 (127)	59 (11)	354 (9)	1146 (232)	759 (110)	983 (300)	1194 (155)	378 (48)	92 (31)	60 (4)
Lu	534 (181)	826 (148)	511 (46)	491 (47)	561 (176)	59 (11)	328 (18)	1010 (219)	613 (95)	828 (270)	1088 (137)	401 (52)	86 (22)	51.5 (7)
Y	439 (14)	411 (49)	64 (6)	93 (17)	360 (27)	136 (26)	343 (10)	110 (15)	118 (11)	139 (23)	157 (30)	454 (28)	144 (16)	128 (9)
Sc			461 (37)	407 (22)				428 (29)	402 (38)	351 (79)	388 (43)			
Pb	< 3.52	< 1.8	13 (3)	7.3 (7)	< 27	1.22 (6)	4.3 (7)	5.0 (5)	14 (2)	4.8 (8)	4.9 (8)	< 9.6	2.85 (16)	< 9.0
Th	< 1.29	0.52 (5)	1.82 (21)	3.4 (5)	4.7 (3)	0.336 (9)	< 1.28	1.7 (2)	3.6 (8)	1.05 (16)	0.76 (13)	5.4 (16)	1.1 (3)	< 1.59
U	6.9 (22)	8.1 (11)	11.7 (21)	6.0 (6)	13 (5)	3.2 (5)	< 8.0	4.1 (7)	18 (2)	10 (3)	4.2 (5)	60 (9)	11.66 (2)	8.3 (2)

All compositions are given in ppm by weight, except for Cl (wt.%); numbers in parentheses are one standard deviation in the last digits. < Detection limits are reported as maximum values when element concentrations were too low to be measured; * reversed experiments; ** Cl concentrations in the fluid of the same experiment are given for reference.

Table S-6 Omphacite compositions.

Experiment	PC09	PC22	PC37	PC38	PC14	PC23	PC10	PC25	PC27	PC36	PC39	PC15	PC24*	PC18*
Cl (wt.%) **	0	0	0	0	0.48	2.25	3.76	3.85	4.91	6.50	6.81	6.93	0	4.23
Li	293 (54)	329 (10)	1461 (52)	1298 (209)	344 (28)	1812 (285)	32 (6)	1115 (43)	1463 (30)	1044 (37)	810 (13)	204 (7)	85 (2)	126 (6)
Be	204 (9)	200 (4)	921 (39)	974 (172)	276 (13)	1065 (69)	88 (5)	798 (37)	855 (16)	804 (69)	882 (41)	203 (47)	109 (18)	153 (31)
B	106 (24)	45 (3)	353 (54)	395 (81)	157 (111)	320 (74)	63 (4)	172 (6)	140 (12)	114 (10)	104 (21)	< 41	80 (24)	97 (28)
Rb	7.2 (5)	37 (2)	120 (38)	102 (32)	9 (2)	380 (85)	3.0 (2)	186 (25)	273 (19)	49 (18)	12 (2)	24 (4)	38 (11)	38 (7)
Cs	2.1 (4)	19.46 (3)	172 (55)	147 (47)	< 2.07	620 (144)	1.30 (7)	277 (40)	413 (66)	81 (28)	26 (4)	2.1 (5)	36 (12)	32 (5)
Sr	52.4 (2)	173 (6)	341 (32)	438 (115)	146 (60)	958 (268)	2.2 (13)	305 (29)	400 (20)	300 (69)	136 (19)	42 (6)	83 (29)	63 (23)
Ba	109 (15)	260 (46)	261 (39)	271 (73)	148 (65)	1193 (456)	7.0 (3)	133 (32)	248 (45)	215 (58)	100 (17)	15 (3)	169 (38)	146 (58)
Ti	< 80	1449 (37)	2711 (411)	2696 (921)	2188 (358)	2123 (110)	5540 (521)	2088 (45)	3769 (945)	2665 (305)	2747 (171)	3664 (853)	1008 (97)	1371 (209)
Nb	< 2.94	9.6 (6)	15 (6)	12 (3)	57 (26)	2.5 (3)	33 (7)	4.9 (3)	28 (7)	2.0 (8)	1.41 (14)	39 (6)	0.49 (4)	4.00 (14)
Ta	< 2.17	2.8 (3)	14 (7)	9 (3)	24 (12)	0.81 (21)	17 (5)	3.0 (2)	25 (7)	2.8 (8)	1.01 (14)	15 (3)	0.38 (11)	1.6 (3)
Zr	20 (3)	13.9 (4)	14.6 (15)	17 (4)	35 (14)	18 (3)	93.9 (5)	13.4 (9)	22 (8)	35 (12)	8.5 (4)	8.4 (13)	11.6 (4)	20 (3)
Hf	9.1 (5)	7.6 (6)	7.0 (4)	9 (2)	34 (18)	4.3 (2)	54 (4)	9.0 (5)	12 (2)	12 (4)	4.1 (5)	10.8 (16)	2.97 (2)	15 (3)
La	9 (5)	104 (6)	43 (10)	46 (18)	303 (185)	41 (9)	1.13 (6)	43 (15)	27 (2)	1.0 (1)	0.6 (2)	51 (5)	70 (44)	31 (10)
Ce	63 (24)	624 (4)	160 (35)	222 (89)	1179 (677)	963 (168)	7.4 (2.4)	141 (44)	93 (7)	4.8 (8)	2.6 (2)	273 (28)	1305 (827)	326 (68)
Nd	15 (2)	110 (3)	46 (11)	49 (20)	315 (190)	45 (10)	6.6 (06)	45 (15)	29 (3)	6.2 (1.4)	5.0 (8)	56 (5)	74 (47)	33 (12)
Sm	16 (3)	104.7 (5)	41 (10)	49 (18)	316 (201)	37 (6)	22 (4)	43 (14)	34 (2)	19 (2)	12.0 (8)	53 (8)	71 (43)	27.4 (5)
Eu	13.5 (7)	111.3 (5)	56 (13)	59 (21)	289 (176)	46 (6)	68 (1)	51 (13)	50 (4)	27 (3)	18.7 (7)	51 (4)	59 (34)	20.8 (5)
Gd	10.0 (1)	109.8 (1)	52 (12)	47 (16)	265 (161)	33 (6)	117 (9)	46 (9)	60 (6)	41 (5)	25 (2)	41 (7)	45 (27)	16 (2)
Dy	25 (11)	106 (2)	51 (12)	42 (12)	189 (113)	24 (4)	260 (7)	49 (6)	86 (16)	57 (8)	24 (2)	42 (10)	18 (8)	9.9 (7)
Er	28 (15)	100 (6)	63 (17)	46 (14)	160 (94)	19 (4)	340 (18)	61 (8)	115 (21)	60 (12)	20 (1)	38 (9)	7.5 (15)	6.4 (6)
Yb	25 (12)	96 (6)	58 (16)	47 (16)	157 (93)	16 (3)	354 (9)	55 (6)	116 (22)	38 (11)	12.4 (4)	36 (7)	7.1 (14)	10.4 (5)
Lu	25 (14)	92 (9)	46 (12)	35 (11)	139 (79)	15 (3)	328 (18)	44 (5)	92 (16)	28 (9)	9.0 (3)	32 (10)	5.3 (3)	8.4 (6)
Y	65 (34)	118 (9)	43 (15)	14 (4)	204 (112)	75 (25)	343 (10)	17 (2)	24 (4)	40 (6)	15.5 (4)	42 (10)	27 (7)	11.6 (6)
Sc			113 (12)	99 (18)				131 (6)	139 (6)	146 (8)	98 (2)			
Pb	20 (7)	33 (3)	72 (8)	57 (16)	69 (34)	3.8 (7)	4.3 (7)	219 (122)	39 (3)	14 (2)	26 (4)	5.2 (7)	30 (12)	93 (30)
Th	5.0 (22)	67.3 (5)	16 (4)	17 (7)	274 (177)	31 (9)	1.28 (4)	14 (6)	9 (1)	0.36 (4)	0.540 (25)	27 (2)	10 (6)	8.9 (9)
U	15 (5)	179 (2)	34 (7)	38 (14)	274 (177)	57 (10)	8.0 (3)	27 (9)	20 (1)	2.3 (4)	1.14 (8)	64 (6)	52 (31)	23.3 (9)

All compositions are given in ppm by weight, except for Cl (wt.%); numbers in parentheses are one standard deviation in the last digits. < Detection limits are reported as maximum values when element concentrations were too low to be measured; * reversed experiments; ** Cl concentrations in the fluid of the same experiment are given for reference.

Table S-7 Rutile compositions.

Experiment	PC09	PC22	PC37	PC38	PC14	PC23	PC10	PC25	PC27	PC36	PC39	PC15	PC24*	PC18*
Cl (wt.%) **	0	0	0	0	0.48	2.25	3.76	3.85	4.91	6.50	6.81	6.93	0	4.23
Li	< 100	< 32	< 112	< 93	< 147	< 46	< 61	< 44	< 409	< 179	< 112	< 214	< 74	< 106
Be	< 297	< 118	< 174	< 107	< 498	< 96	< 168	< 117	< 483	< 126	< 174	< 449	< 190	< 197
B	< 164	< 132	< 184	< 251	< 350	< 84	< 75	< 109	< 562	< 188	< 184	< 225	< 155	< 139
Rb	< 11	< 1.5	< 125	< 34	< 11	< 113	< 6	< 16	< 416	< 75	< 125	< 11	< 7	< 9
Cs	< 2	< 0.8	< 220	< 88	< 5	< 156	< 1.6	< 2	< 1250	< 79	< 220	< 5	< 2	< 8
Sr	< 48	< 17	< 96	< 165	< 45	< 75	< 10	< 23	< 490	< 87	< 96	< 15	< 4	< 47
Ba	< 133	< 40	< 126	< 76	< 67	< 94	< 11	< 15	< 521	< 90	< 126	< 31	< 10	< 126
Nb	10584 (608)	11863 (682)	7067 (285)	7257 (219)	10278 (344)	2475 (80)	8164 (264)	7306 (244)	7539 (227)	7226 (161)	7067 (285)	11319 (494)	1067 (43)	1611(157)
Ta	6117 (488)	6568 (523)	7363 (362)	7862 (377)	5893 (232)	1223 (32)	4072 (105)	6688 (263)	8110 (389)	7095 (364)	7363 (362)	5476 (301)	528.0 (3)	882(97)
Zr	300.8 (3)	243.3 (2)	309 (23)	341 (13)	260 (15)	341 (17)	307 (16)	401 (24)	302 (12)	331 (29)	309 (23)	346 (42)	276 (10)	274(16)
Hf	263 (16)	257 (16)	130 (23)	104 (12)	193 (41)	58 (10)	307 (52)	261 (55)	138 (16)	112 (18)	130 (23)	341 (16)	69 (20)	189(17)
La	< 7	< 14	< 6	< 38	< 37	< 3	< 36	< 10	< 20	< 4	< 6	< 4	< 7	< 122
Ce	< 69	< 104	< 27	< 147	< 307	< 129	< 172	< 51	< 74	< 9	< 27	< 6	< 123	< 1057
Nd	< 12	< 7	< 14	< 48	< 50	< 4	< 32	< 11	< 21	< 9	< 14	< 28	< 16	< 71
Sm	< 22	< 23	< 16	< 49	< 31	< 5	< 16	< 8	< 29	< 14	< 16	< 25	< 11	< 58
Eu	< 5	< 16	< 9	< 44	< 26	< 4	< 26	< 14	< 25	< 6	< 9	< 7	< 9	< 58
Gd	< 12	< 20	< 13	< 37	< 33	< 7	< 14	< 14	< 33	< 14	< 13	< 27	< 12	< 33
Dy	< 12	< 13	7	< 17	< 20	< 3	< 22	< 5	< 19	< 14	< 7	< 23	< 5	< 12
Er	< 11	< 8	< 10	< 9	< 27	< 4	< 10	< 7	< 7	< 18	< 10	< 19	< 6	< 15
Yb	< 9	< 17	< 11	< 12	< 29	< 4	< 19	< 5	< 11	< 18	< 11	< 20	< 9	< 22
Lu	< 2	< 9	< 3	< 3	< 10	< 0.8	< 11	< 2	< 7	< 9	< 3	< 6	< 4	< 4
Y	< 4	< 9	< 3	< 5	< 15	< 4	< 15	< 2	< 8	< 7	< 3	< 8	< 10	< 10
Sc			< 39	< 38				< 36	< 24	< 51	< 39			
Pb	< 17	< 3	< 39	< 34	< 35	< 5	< 13	< 16	< 216	< 54	< 39	< 18	< 6	< 33
Th	< 3	< 8	< 3	< 20	< 26	< 4	< 15	< 4	< 9	< 2	< 3	< 6	< 3	< 18
U	< 31	< 33	< 8	< 39	< 61	< 8	< 59	< 24	< 36	< 19	< 8	< 74	< 20	< 92

All compositions are given in ppm by weight, except for Cl (wt.%); numbers in parentheses are one standard deviation in the last digits. < Detection limits are reported as maximum values when element concentrations were too low to be measured; * reversed experiments; ** Cl concentrations in the fluid of the same experiment are given for reference.

Table S-8 Fluid/eclogite partition coefficients.

Experiment	PC09	PC22	PC37	PC38	PC14	PC23	PC10	PC25	PC27	PC36	PC39	PC15	PC24*	PC18*
Cl (wt.%) **	0	0	0	0	0.48	2.25	3.76	3.85	4.91	6.50	6.81	6.93	0	4.23
Li	> 0.74	0 (11)	1.25 (7)	1.27 (21)	> 1.01	1.1 (3)	> 1.7	2.06 (9)	1.01 (4)	1.50 (8)	1.48 (9)	3.3 (3)	> 0.32	> 0.52
Be	> 0.32	> 0.15	1.02 (6)	0.87 (16)	> 0.45	0.66 (8)	> 1.3	1.42 (7)	1.23 (11)	0.91 (10)	0.70 (11)	> 2.2	> 0.19	> 0.74
B	> 7.9	> 0.51	4.5 (6)	3.7 (7)	> 0.92	4.9 (16)	> 25	27 (1)	22 (2)	40 (4)	27 (6)	> 3.8	> 1.04	> 4.7
Rb	> 34	1.82 (9)	20 (6)	25 (8)	> 43	10 (3)	> 170	45 (7)	17.6 (14)	185 (73)	349 (77)	> 24	> 4.2	> 17
Cs	> 9.1	> 1.6	19 (6)	23 (7)	> 11	13 (4)	> 88	59 (9)	69 (16)	152 (55)	398 (96)	> 60	> 3.9	> 21
Sr	6.0 (3)	> 0.86	5.3 (6)	3.1 (8)	9 (4)	2.3 (7)	14 (3)	10 (3)	11.1 (7)	12 (3)	15 (3)	43 (9)	1.1 (5)	11(4)
Ba	> 3.6	> 0.99	9.7 (15)	8.2 (23)	> 12	2.6 (12)	> 112	28 (7)	27 (5)	34 (12)	23 (5)	> 153	> 2.6	> 19
Ti	> 0.075	0.0274 (17)	0.116 (8)	0.103 (12)	0.075 (10)	0.133 (13)	0.131 (15)	0.287 (13)	0.063 (7)	0.15 (3)	0.149 (19)	0.065 (8)	0.055 (5)	0.191 (18)
Nb	> 0.049	0.01748 (16)	0.116 (7)	0.092 (4)	0.073 (7)	0.079 (6)	0.154 (12)	0.148 (12)	0.047 (4)	0.148 (13)	0.078 (6)	0.069 (6)	0.033 (4)	0.089 (6)
Ta	> 0.0067	0.00294 (11)	0.021 (2)	0.015 (1)	0.015 (2)	0.0126 (16)	> 0.017	0.025 (3)	0.009 (1)	0.018 (2)	0.0130 (17)	0.020 (2)	0.0077 (16)	> 0.043
La	> 0.041	0.0028 (2)	0.018 (4)	0.013 (6)	0.0083 (78)	0.028 (10)	> 0.24	0.10 (4)	0.25 (3)	6.0 (18)	7 (3)	1.22 (18)	0.12 (8)	> 0.62
Ce	0.060 (25)	0.0041 (5)	0.026 (5)	0.017 (7)	0.014 (12)	0.049 (17)	0.27 (13)	0.17 (6)	0.25 (3)	4.4 (12)	6.3 (17)	0.85 (12)	0.08 (5)	0.64 (16)
Nd	> 0.023	0.0034 (2)	0.020 (5)	0.014 (6)	> 0.0093	0.031 (10)	> 0.22	0.10 (4)	0.25 (3)	0.9 (3)	1.0 (3)	0.74 (10)	0.10 (6)	> 0.46
Sm	0.028 (6)	0.0042 (1)	0.022 (5)	0.015 (5)	0.010 (8)	0.030 (7)	0.16 (7)	0.09 (3)	0.128 (14)	0.24 (7)	0.28 (5)	0.33 (4)	0.07 (4)	0.437 (16)
Eu	0.039 (1)	0.0069 (2)	0.028 (4)	0.023 (5)	0.018 (14)	0.050 (11)	0.23 (5)	0.114 (25)	0.161 (18)	0.34 (10)	0.56 (15)	0.89 (8)	0.07 (3)	0.43 (3)
Gd	0.029 (9)	0.0046 (3)	0.014 (2)	0.010 (2)	0.010 (7)	0.030 (5)	0.071 (11)	0.052 (10)	0.040 (5)	0.11 (3)	0.076 (14)	0.165 (18)	0.045 (15)	0.242 (21)
Dy	0.017 (3)	0.0041 (4)	0.0088 (14)	0.0064 (7)	0.008 (4)	0.023 (2)	0.032 (3)	0.021 (3)	0.0111 (14)	0.045 (12)	0.020 (3)	0.053 (5)	0.025 (7)	0.129 (11)
Er	0.010 (3)	0.0025 (4)	0.0055 (9)	0.0037 (5)	0.0050 (17)	0.014 (3)	0.017 (3)	0.012 (3)	0.0052 (9)	0.022 (7)	0.009 (2)	0.031 (4)	0.022 (9)	0.166 (21)
Yb	0.007 (3)	0.0019 (4)	0.0048 (8)	0.0037 (8)	0.0047 (16)	0.016 (3)	0.0152 (18)	0.011 (3)	0.006 (1)	0.015 (6)	0.008 (2)	0.033 (7)	0.033 (16)	0.25 (4)
Lu	0.006 (3)	0.0014 (3)	0.0037 (7)	0.0032 (7)	0.0048 (018)	0.014 (3)	0.0129 (25)	0.011 (4)	0.005 (1)	0.012 (5)	0.008 (2)	0.032 (6)	0.031 (13)	0.35 (5)
Y	0.062 (5)	0.016 (3)	0.18 (6)	0.15 (6)	0.07 (3)	0.049 (14)	0.13 (3)	0.35 (9)	0.30 (6)	0.29 (9)	0.15 (5)	0.31 (10)	0.075 (14)	0.47 (15)
Sc			0.0131 (14)	0.0120 (11)				0.033 (2)	0.0123 (13)	0.024 (4)	0.021 (4)			
Pb	> 8.1	> 0.84	7.6 (9)	6.1 (16)	> 3.4	4.7 (10)	> 64	13 (8)	30 (5)	142 (29)	58 (16)	> 60	1.1 (5)	> 7.3
Th	> 0.053	0.00123 (3)	0.015 (5)	0.010 (5)	0.01 (1)	0.019 (8)	> 0.043	0.06 (2)	0.064 (9)	1.12 (16)	0.88 (17)	0.33 (4)	0.12 (8)	> 0.27
U	1.2 (5)	0.045 (3)	0.47 (12)	0.37 (014)	0.17 (12)	0.39 (11)	1.9 (9)	2.8 (9)	1.04 (14)	12 (3)	15 (3)	2.5 (3)	0.34 (22)	7.8 (9)

Numbers in parentheses are one standard deviation in the last digits; > minimum values of D are reported when only maximum concentrations of trace elements were available for garnet and/or omphacite.; * reversed experiments; ** Cl concentrations in the fluid of the same experiment are given for reference.

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