

Table S1. Microprobe Analysis of Trace Element on Quartz Phenocryst and Calculated Ti-in-Quartz Temperature. Notes: number in parentheses next to each analysis represents 1σ and given in terms of least unit cited.

Sample no.	SiO2 (wt%)	Al (ppm)	Ti (ppm)	Ti-in-quartz (°C)		
				Wark & Watson	Huang & Audétat	
Er-24	qtzHr1 - 1	100.23	n.d.	96 (5)	742 (6)	702(6)
	qtzHr1 - 2	99.77	829 (53)	9 (5)	522 (33)	489(32)
	qtzHr1 - 3	100.23	n.d.	n.d.	-	-
	qtzHr1 - 4	98.72	95 (52)	114 (5)	763 (5)	722(5)
	qtzHr1 - 5	100.53	n.d.	18 (5)	575 (21)	539(21)
	qtzHr2 - 1	100.29	n.d.	n.d.	-	-
	qtzHr2 - 2	100.72	n.d.	9 (5)	525 (33)	492(32)
	qtzHr2 - 3	100.72	n.d.	49 (5)	669 (10)	631(10)
	qtzHr2 - 4	100.79	14 (50)	13 (5)	552 (26)	518(25)
	qtzHr2 - 5	100.60	20 (51)	20 (5)	583 (20)	548(19)

Table S2. Microprobe Analysis of Trace Element on Quartz-Molybdenite Vein and Calculated Ti-in-Quartz Temperature. Notes: number in parentheses next to each analysis represents 1σ and given in terms of least unit cited.

	Sample no.	SiO2 (wt%)	Al (ppm)	Ti (ppm)	Ti-in-quartz (°C)	
					Wark & Watson	Huang & Audétat
Er-24	qtz-mol-1	98.63	55 (48)	68 (5)	703 (8)	663 (8)
	qtz-mol-2	99.11	n.d.	34 (5)	634 (12)	596 (12)
	qtz-mol-3	99.29	n.d.	n.d..	-	-
	qtz-mol-4	99.60	n.d.	n.d..	-	-
	qtz-mol-5	99.63	5 (50)	59 (5)	687 (9)	648 (9)
	qtz-mol-6	100.55	31 (49)	14 (5)	556 (25)	521 (24)
	qtz-mol-7	100.67	84 (48)	40 (5)	648 (11)	611 (11)
	qtz-mol-8	99.50	233 (50)	15 (5)	559 (24)	524 (24)
	qtz-mol-9	99.57	n.d.	20 (5)	585 (20)	550 (19)
	qtz-mol-10	99.88	n.d.	15 (5)	562 (24)	527 (23)
	qtz-mol-11	99.67	197 (51)	20 (5)	583 (20)	548 (19)
	qtz-mol-12	99.79	56 (50)	14 (5)	554 (26)	519 (25)
	qtz-mol-13	99.33	51 (49)	n.d.	-	-
	qtz-mol-14	99.33	1463 (56)	n.d.	-	-
	qtz-mol-15	99.77	95 (50)	55 (5)	680 (9)	642 (9)
	qtz-mol-16	99.76	235 (50)	84 (5)	727 (7)	687 (7)
	qtz-mol-17	100.03	97 (50)	6 (5)	493 (44)	460 (43)
	(qtz-mol) Line 1	99.89	62 (50)	n.d.	-	-
	(qtz-mol) Line 2	100.25	n.d.	11 (5)	537 (30)	503 (29)

(qtz-mol) Line 3	100.42	83 (49)	13 (5)	552 (26)	518 (25)
(qtz-mol) Line 4	100.34	165 (50)	23 (5)	596 (18)	560 (17)
(qtz-mol) Line 5	100.45	140 (49)	24 (5)	601 (17)	564 (17)
(qtz-mol) Line 6	100.12	110 (49)	21 (5)	589 (19)	553 (18)
(qtz-mol) Line 7	100.38	75 (50)	11 (5)	540 (29)	505 (28)
(qtz-mol) Line 8	100.57	n.d.	9 (5)	521 (34)	488 (33)
(qtz-mol) Line 9	100.45	30 (50)	13 (5)	552 (26)	517 (25)
(qtz-mol) Line 10	100.32	180 (49)	23 (5)	596 (18)	560 (17)
(qtz-mol) Line 11	100.03	112 (49)	34 (5)	634 (13)	596 (13)
(qtz-mol) Line 12	99.95	95 (49)	n.d.	-	-
(qtz-mol) Line 13	99.78	n.d.	n.d.	-	-
(qtz-mol) Line 14	99.05	n.d.	82 (5)	724 (7)	684 (7)
(qtz-mol) Line 15	100.84	167 (51)	n.d.	-	-

Table S3. Microprobe Analysis of Trace Element on Quartz-Pyrite Vein and Calculated Ti-in-Quartz Temperature. Notes: number in parentheses next to each analysis represents 1σ and given in terms of least unit cited.

Sample no.	SiO ₂ (wt%)	Al (ppm)	Ti (ppm)	Ti-in-quartz (°C)	
				Wark & Watson	Huang & Audétat
qtz-py-1	100.14	67 (49)	69 (5)	705 (8)	666 (8)
qtz-py-2	100.20	304 (51)	74 (5)	712 (8)	673 (7)
qtz-py-3	100.07	n.d.	11 (5)	540 (29)	506 (28)
qtz-py-4	99.81	n.d.	n.d.	-	-
qtz-py-5	100.12	141 (50)	46 (5)	663 (11)	625 (10)
qtz-py-6	99.94	n.d.	41 (5)	650 (12)	612 (11)
qtz-py-7	99.82	15 (50)	n.d.	-	-
qtz-py-8	99.71	n.d.	n.d.	-	-
qtz-py-9	99.46	145 (51)	3 (5)	444 (68)	413 (65)
qtz-py-10	100.05	49 (49)	n.d.	-	-
qtz-py-11	99.84	n.d.	n.d.	-	-
qtz-py-12	99.99	n.d.	11 (5)	535 (30)	501 (29)
qtz-py-13	100.21	n.d.	21 (5)	588 (18)	553 (17)

Table S4. Microprobe Analysis of Trace Element on Quartz Vein and Calculated Ti-in-Quartz Temperature. Notes: number in parentheses next to each analysis represents 1σ and given in terms of least unit cited.

Sample no.	SiO ₂ (wt%)	Al (ppm)	Ti (ppm)	Ti-in-quartz (°C)	
				Wark & Watson	Huang & Audétat
qtz-1	99.90	26 (49)	10 (5)	529 (32)	495 (31)
qtz-2	100.47	n.d.	n.d.	-	-
qtz-3	100.27	n.d.	n.d.	-	-
qtz-4	100.41	n.d.	n.d.	-	-
qtz-5	100.01	34 (49)	n.d.	-	-
qtz-6	100.19	n.d.	n.d.	-	-
qtz-7	99.92	n.d.	n.d.	-	-
qtz-8	99.69	15 (50)	n.d.	-	-

qtz-9	100.15	56 (49)	n.d.	-	-
qtz-10	100.49	n.d.	n.d.	-	-
qtz-11	99.91	654 (52)	n.d.	-	-

Table S5. Electron Microprobe Analyses of Biotite 1, Calculated Formulas (based on 22 O), Calculated Ti-In-Biotite Temperatures, and analytical error of each measurement point.

	bioti	b	b	b	b	b	b	b	b	bi	bi	bi	bi	bi	bi	bi	bi	bi	bi	bi	bi	bi	bi	bi
	te_1	i	i	i	i	i	i	i	i	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	-1	o	o	o	o	o	o	o	o	ti	ti	ti	ti	ti	ti	ti	ti	ti	ti	ti	ti	ti	ti	ti
		ti	ti	ti	ti	ti	ti	ti	ti	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t
		t	t	t	t	t	t	t	t	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
		e	e	e	e	e	e	e	e	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2
		2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4
SiO2	39.0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	9	9	9	9	9	9	9	9	9	8.	8.	9.	8.	9.	8.	9.	9.	8.	9.	9.	9.	9.	8.	9.
		.	.	.	.	.	.	.	.	9	6	1	9	5	5	2	6	9	0	2	2	2	9	4
		2	7	0	1	0	0	2	1	6	7	3	8	0	9	5	4	9	2	9	4	6	7	3
TiO2	2.04	2	1	1	1	2	1	1	2	1.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
		.	.	.	.	.	.	.	.	8	0	2	1	2	0	3	0	2	3	1	3	5	2	6
		2	9	8	8	0	8	3	1	4	2	5	9	6	8	7	0	0	2	2	3	1	5	0
		6	3	0	5	3	4	4	4															
Al2O3	17.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	4	6	7	7	7	7	7	7	7	7.	6.	6.	6.	7.	7.	6.	6.	6.	6.	6.	6.	8.	6.	6.
		.	.	.	.	.	.	.	.	2	8	9	9	2	6	4	9	9	7	7	9	7	0	8
		2	2	4	4	1	1	1	1	2	6	0	0	1	9	0	0	2	5	9	6	6	9	1
FeO	7.87	7	7	7	7	7	8	7	7	8.	8.	8.	8.	7.	7.	7.	7.	7.	7.	7.	8.	7.	8.	8.
		.	.	.	.	.	.	.	.	0	1	0	1	8	5	7	7	8	9	8	7	1	6	2
		9	6	6	7	7	0	8	9	2	4	1	8	8	4	4	6	6	0	1	5	4	4	9
		7	3	9	8	4	7	2	8															
MnO	0.54	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	3	3	4	3	3	4	3	3	2	3	4	4	3	3	2
		5	4	3	3	3	4	2	3	3	6	9	7	9	4	3	6	4	7	0	2	7	5	2
		0	4	9	3	1	6	6	1															

MgO	17.8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	5	7	7	8	7	7	8	8	7	8.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	8.	7.
		.	.	.	.	.	.	.	.	2	5	5	9	4	9	7	6	9	5	7	9	5	0	7
		6	9	2	8	8	0	4	7	5	2	3	1	6	5	8	9	7	5	5	2	1	3	6
CaO	0.01	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	1	0	0	0	0	0	0															
Na2O	0.18	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	1	1	2	1	1	1	2	1	1	1	1	2	2	1	1
		1	2	1	0	1	0	1	1	4	6	1	5	5	0	0	3	0	4	4	1	1	4	6
K2O	11.2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	0	0	1	1	1	1	1	1	1	1.	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
		.	.	.	.	.	.	.	.	2	1	9	4	3	4	1	5	3	5	3	1	3	5	2
		9	4	3	7	0	0	3	2	2	3	9	3	4	7	6	0	6	9	6	7	8	6	4
Cl	n.d.	n	n	n	n	n	n	n	n	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.
		.	.	.	.	.	.	.	.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
		d	d	d	d	d	d	d	d															
		.	.	.	.	.	.	.	.															
F	n.d.	n	n	n	n	n	n	n	n	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.	n.
		.	.	.	.	.	.	.	.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
		d	d	d	d	d	d	d	d															
		.	.	.	.	.	.	.	.															
Total	95.9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
	1	4	6	6	6	5	5	5	5	5.	4.	5.	6.	6.	5.	5.	5.	5.	5.	5.	5.	6.	7.	6.
		.	.	.	.	.	.	.	.	9	8	5	1	1	8	2	9	6	6	6	9	1	0	4
		9	6	1	2	2	7	8	7	8	8	0	0	9	6	4	8	4	5	6	9	3	4	9
		7	3	8	4	7	8	4	9															
Si	0.65	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
		6	6	6	6	6	6	6	6	5	4	5	5	6	4	5	6	5	5	5	5	5	5	6
		5	6	5	5	5	5	5	5															
Ti	0.03	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	2	2	2	3	2	2	3															

Al	0.34	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		3	3	3	3	3	3	3	3	4	3	3	3	4	5	2	3	3	3	3	3	3	5	3
		2	4	4	4	4	4	4	4															
Fe	0.11	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	2
		1	1	1	1	1	1	1	1															
Mn	0.01	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	0	0
		1	1	1	0	0	1	0	0															
Mg	0.44	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		4	4	4	4	4	4	4	4	5	3	4	4	3	5	4	4	5	4	4	4	3	5	4
		4	5	5	4	4	5	6	4															
Ca	0.00	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0															
Na	0.01	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	1	0	1
		1	1	0	0	0	0	1	0															
K	0.24	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		2	2	2	2	2	2	2	2	4	4	3	4	4	4	4	4	4	5	4	4	4	5	4
		3	4	4	5	4	4	4	4															
Xmg	0.80	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		.	.	.	.	.	.	.	.	8	7	8	8	8	8	8	8	8	8	8	8	7	8	7
		8	8	8	8	8	8	8	8	0	9	0	0	0	1	0	0	0	0	0	0	9	1	9
		0	1	1	0	0	0	1	0															
T (°C)	716	7	7	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
		2	1	0	0	1	0	5	2	0	1	2	2	2	2	3	1	2	3	2	3	4	3	4
		9	0	1	3	7	1	7	1	2	3	7	3	8	3	8	4	7	2	2	5	0	0	4
1σ of T(°C)	3	3	3	3	3	4	5	3	3	3	3	3	3	3	3	2	3	3	3	3	3	2	3	2

	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SiO	.	.	.	.	.	.	.	.	.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	1															
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TiO	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	7	7	7	7	7	7	7	7	7	7	7	7	8	7	8
	7	7	7	7	7	7	7	7	6	7														
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Al2	.	.	.	.	.	.	.	.	.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O3	1	1	1	1	1	1	1	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	5	5	5	5	5	5	5	5	5															
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Fe	.	.	.	.	.	.	.	.	.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O	1	1	1	1	1	1	1	1	1	3	3	2	3	2	2	2	2	2	2	2	2	3	2	3
	2	2	2	2	2	2	3	2	3															
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Mn	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O	0	0	0	0	0	0	0	0	0	7	7	7	7	8	8	7	7	7	7	8	7	7	7	6
	8	8	8	7	7	7	8	7	7															
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Mg	.	.	.	.	.	.	.	.	.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O	1	1	1	1	1	1	1	1	1	7	6	6	7	6	7	7	6	7	6	7	7	6	7	7
	7	7	7	7	7	7	7	7	7	6														
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Ca	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0
	1	0	1	0	0	0	0	0	0															
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Na	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	4	4	4	4	4	4	4	4	4															
	0	0	0	0	0	0	0	0	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
K2	.	.	.	.	.	.	.	.	.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
O	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	3	3	3	3	3	3	3	3	3															

Table S6. Electron Microprobe Analyses of Biotite 2, Calculated Formulas (based on 22 O), Calculated Ti-In-Biotite Temperatures, and analytical error of each measurement point.

	biotite _2-1	biot ite_ 2-2	biot ite_ 2-3	biot ite_ 2-4	biot ite_ 2-5	biot ite_ 2-6	biot ite_ 2-7	biot ite_ 2-8	biot ite_ 2-9	biot te_2 -10	biot te_2 -11	biot te_2 -12	biot te_2 -13	biot te_2 -14
SiO ₂	39.30	38.7	39.4	38.4	39.4	39.2	39.2	38.8	39.6	39.6	39.1	39.1	39.1	38.7
		7	0	8	4	7	3	3	0	8	9	1	7	1
TiO ₂	2.45	2.18	2.05	2.42	2.10	2.26	2.31	2.19	2.46	1.83	2.35	2.67	2.57	2.56
Al ₂ O ₃	16.45	17.1	17.8	17.4	17.0	17.2	16.8	16.7	16.9	17.0	17.1	17.0	17.1	17.0
		5	6	9	9	0	4	8	7	7	2	5	9	0
FeO	8.08	7.47	7.16	8.05	7.72	7.77	7.61	7.83	7.78	7.37	8.11	8.44	7.35	7.89
MnO	0.33	0.39	0.47	0.37	0.31	0.53	0.37	0.29	0.37	0.42	0.50	0.43	0.35	0.35
MgO	17.88	18.1	18.2	17.9	17.7	18.0	17.8	17.9	17.2	18.4	17.9	17.6	17.7	17.9
		6	0	5	4	5	2	5	7	9	8	1	9	0
CaO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Na ₂ O	0.11	0.12	0.04	0.18	0.15	0.17	0.10	0.22	0.12	0.23	0.12	0.10	0.14	0.18
K ₂ O	11.12	11.1	11.7	11.6	11.2	10.8	11.0	10.8	11.3	11.4	11.3	11.1	10.9	10.9
		7	5	6	9	3	8	8	5	8	7	8	5	6
Cl	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
F	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Total	95.71	95.4	96.9	96.6	95.8	96.0	95.3	94.9	95.9	96.5	96.7	96.5	95.5	95.5
		1	1	1	4	7	7	7	3	6	5	9	1	5
Si	0.65	0.65	0.66	0.64	0.66	0.65	0.65	0.65	0.66	0.66	0.65	0.65	0.65	0.64
Ti	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
Al	0.32	0.34	0.35	0.34	0.34	0.34	0.33	0.33	0.33	0.33	0.34	0.33	0.34	0.33
Fe	0.11	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.11	0.12	0.10	0.11
Mn	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00
Mg	0.44	0.45	0.45	0.45	0.44	0.45	0.44	0.45	0.43	0.46	0.45	0.44	0.44	0.44
Ca	0.00	0.00	0.00	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	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01
K	0.24	0.24	0.25	0.25	0.24	0.23	0.24	0.23	0.24	0.24	0.24	0.24	0.23	0.23
Xmg	0.80	0.81	0.82	0.80	0.80	0.81	0.81	0.80	0.80	0.82	0.80	0.79	0.81	0.80
T (°C)	739	730	723	738	721	731	736	728	740	708	733	745	751	747
1σ of T(°C)	2	3	3	2	3	3	3	3	2	3	3	2	2	2
Error (1σ)	SiO ₂	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
	TiO ₂	0.08	0.07	0.07	0.08	0.07	0.08	0.07	0.08	0.07	0.08	0.08	0.08	0.08
	Al ₂ O ₃	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	FeO	0.13	0.12	0.12	0.13	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.12	0.12
	MnO	0.07	0.08	0.07	0.07	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.07	0.07

MgO	0.17	0.17	0.17	0.17	0.16	0.17	0.17	0.17	0.16	0.17	0.17	0.17	0.17	0.17
CaO	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Na2O	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
K2O	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13

Table S7. Summary of Microthermometric data of different vein paragenesis.

Vein type	T _n (°C)	Si ze (μm)	Occurrences	Homogenization State	Vei					Vei					Homogenization State
					ei	T _n (°C)	Si ze (μm)	Occurrences	Homogenization State	ei	T _n (°C)	Si ze (μm)	Occurrences	Homogenization State	
Qtz - mol	1				Q	1				Q	1	1.7			
	23	1.5	trails	V-L	tz	19	1.2	trail (elongate)	V-L	tz	16	7.4	solitary	V-L	
	1				p	3									
	1	25				1	19	trail			1	19	1.9	solitary	V-L
	1	1.5	trails	V-L		3	1.2	(rounded)	V-L		3	5			
	4					2					5				
	1	24				1		solitary			1	19	1.2		
	8	2	trails	V-L		21	1.2	(elongate)	V-L		6	5	trail	V-L	
	8					5					5				
	1					1		solitary			1		1		
	26	1.5	trails	V-L		24	2.5	(sub-rounded)	V-L		24	9	2	trail	V-L
	7	6				3	8				9	2			
	3														
	1	30				1		solitary			1	27	1.3	trail (rounded)	V-L
	1	1	solitary	V-L		23	1.8		V-L		5	1			
	3	3				0					1				
	1					1		solitary			1		1.3	solitary	V-L
	30					13		ry			28				
	5	1	trails	V-L		7	1.2	(sub-rounded)	V-L		4	7	y (rounded)		
	3					6									
	1					1					1	16	1.6	solitary	V-L
	21	1	solitary	V-L		16	1	trail	V-L		8				
	7	3				0	5				6				

1	21				1	18				4	22	assem	
	2.	1	trails	V-L		7.	1. 2	-	V-L		8.	blages	V-L
	5					6					2	??	
1					1					1	2.3	solitar	
												y	
	25					23					17	(roun	
	7.	1.	trails	V-L		9.	1. 2	trail	V-L		3.	ded, near	V-L
	5	5				2					2	grain bound ary)	
1			solitary		1					1	1.2		
	28		(near			26					20		
	0.	2.	grain	V-L		7.	1. 5	trail	V-L		8.	solitar	V-L
	3	5	bounda			4					3	y	
			ry)										
1	30	1.	trails		1	29	1. 3	trail		1	21	1	
	3.	5	(near	V-L		1.	3	(roun	V-L		5.	solitar	V-L
	9		mol)			5		ded)			8	y	
1	30	2.	trails		1	19	1. 5			1	18	1.5	
	1	4	(near	V-L		2.			V-L		9.	-	V-L
			mol)			3					4		
1					1					1	1.2	solitar	
												y	
	14		solitary			25	1. 4				21	(near	
	3.	3	(rounde	V-L		2.		near	V-L		3.	grain	V-L
	7		d)			2		vein- wall			9	bound ary	
1					1					1	1.4	solitar	
												y	
	25		solitary			25	1. 3				23	(near	
	5.	2.	(rounde	V-L		1.			V-L		6.	grain	V-L
	7	2	d)			1					1	bound ary	
1	22	2.	solitary		1	20	1. 2	solita		1	23	1.4	
	8.	4	(rounde	V-L		4.		ry	V-L		4.	trail	V-L
	5		d)			6		(roun ded)			2	(fract ure?)	
1	24	1.	solitary		1	23	1. 5	solita		2	11	1- 1.5	trail
	2.	5	(rounde	V-L		5.		ry	V-L		7		(elong
	6		d)			3		(near					ate,

										grain boun dary)			fractu re?)		
1	26	1.	trail	V-L	1	30	2.	solita ry (roun ded)	V-L	3	17	1.6	solitar y (roun ded)	V-L	
1	28	1	-	V-L	1	30	1.	solita ry	V-L	1	12	1.5	-	V-L	
	7					6.	8				2.				
						9					2				
1	24	2.	solitary(rounde d)	V-L	1	11	1.	-	V-L	1	24	1.6	solitar y	V-L	
	7.	5				4.	2				3.				
	7					6					5				
1	28	1	elongat e	V-L	1	18	2	solita ry (sub- roun ded)	V-L	1	13	1	prima ry?	V-L	
	1.					3.					6.				
	9					4					7				
1	30	1.	Solitary (elongat e, near mol)	V-L	1	13	1.	solita ry (recta ngula r, near grain boun dary)	V-L	1	16	1.8	solitar y (roun ded)	V-L	
	0	5				3.	6				5				
						9									
1	32	1	Solitary (elongat e, near mol)	V-L	1	17	1	trail	V-L	1	16	1	trail	V-L	
	0					0.					2.				
						9					9				
1	27	2.	solitary(rounde d)	V-L	1	29	1.	solita ry (near grain boun dary)	V-L	1	32	1.6	solitar y	V-L	
	2.	2				6.	2				9				
	1					4									
1	30	2.	Solitary (sub- rounde d)	V-L	1	14	1.	-	V-L	4	15	1	trail (fract ure?)	V-L	
	8.	3				0	6				1.				
	5										3				

1		trail		1		solita		2	1.5		
		(sub-				ry					
28	1.	rounde		23		(near		18		solitar	
2.	5	d, near	V-L	0.	1	grain	V-L	1.		y	V-L
1		grain		3		boun		6			
		bounda				dary)					
		ry)									
1				1		n.		2	1.3	solitar	
29		solitary				d.		14		y	
8.	2	(rectang	V-L	-				7.		(roun	V-L
1		ular)						9		ded)	
1	30			1		n.		1	23	1.2	
7.	1.	?	V-L	16		d.		1.		-	V-L
2	8			8				7			
1	34			1	25	n.		1	23	1.4	
0.	1	solitary	V-L	6.		d.		8.		-	V-L
2				3				4			
1	15			1	26	n.		1	25	2	
8.	2.	solitary				d.					
1	3	(rounde	V-L	8.				3		-	V-L
		d)		4							
1	25			1	26	n.		1	25	2.2	
4.	2	(sub-	V-L	8.		d.					
2		rounde		4				0.		solitar	V-L
		d)						8		y	
1				1		n.		5		1	assem
						d.					blages
32				29				22			
7.	2	solitary	V-L	6.				1.		near	V-L
3				5				9		grain	
										bound	
										ary	
1				1		n.		2	1.6	assem	
						d.			5	blages	
17	1.	trail		30				29		near	
1	9	(rounde	V-L	4.				4.		grain	V-L
		d)		8				5		bound	
										ary	
1	17			1	33	n.		2	20	1.5	trail
	3	(elongat	V-L	2.		d.			2.		(fract
		e)		9				8		ure?)	V-L

1	21	1.	solitary	V-L	1	33	n.	2	26	1.8
	7.	7				6.	d.		1.	-
	5					5			3	
1	17	n.			1	32	n.	1	11	n.
	9.	d.		V-L		6.	d.		7.	d.
	1	.				9			9	
1	23	n.			1	35	n.	1	24	n.
	4.	d.				8.	d.		3.	d.
	6					9			3	
1	28	n.			1	14	n.	1		n.
	1.	d.				7.	d.		19	d.
	2					8			5	
1	29	n.			1	15	n.	1	17	n.
	5.	d.				7.	d.		3.	d.
	1					6			9	
1	30	n.			1	17	n.	1		n.
	0	d.				9.	d.		22	d.
						3			0	
1	26	n.			1	32	n.	1	23	n.
	4	d.				6.	d.		8.	d.
						9			3	
1	26	n.			1	35	n.	1	23	n.
	3.	d.				8.	d.		0.	d.
	8					9			2	
1	26	n.			1	14	n.	1	22	n.
	9.	d.				7.	d.		8.	d.
	5					8			3	
1	32	n.			1	15	n.	1	18	n.
	2.	d.				7.	d.		5.	d.
	4					6			3	
1	32	n.			1	17	n.	1	14	n.
	0.	d.				9.	d.		2.	d.
	8					3			2	
1	31	n.			3	24	n.	1	16	n.
	8.	d.				1.	d.		6.	d.
	4					9			7	
1	25	n.			2		n.	1	17	n.
	7.	d.				24	d.		7.	d.
	6					8			5	

1	26	n.	1	17	n.
	7.	d.		2.	d.
	5			2	
1	30	n.	1	14	n.
	0.	d.		8.	d.
	5			3	
2	32	n.	3	10	n.
	4	d.		8.	d.
				6	
4	22	n.	1	10	n.
	9.	d.		8.	d.
	5			6	
			1	10	n.
				8.	d.
				6	
			1	13	n.
				7.	d.
				3	
			1	13	n.
				7.	d.
				3	
			2	19	n.
				0.	d.
				5	
			2	14	n.
				9.	d.
				7	
			2	19	n.
				4.	d.
				1	
			2	20	n.
				1.	d.
				5	

