Table 1. Results from Twannberg analysis. All errors are ±1σ.

Element	Solid metal	Schreibersite
Fe (wt%)	93.6 ± 0.7	71.2 ± 0.9
P (wt%)	0.24 ± 0.07	15.3 ± 2.0
Ni (wt%)	3.5 ± 0.5	11.7 ± 0.3
Co (wt%)	0.46 ± 0.03	0.147 ± 0.007
Ga (ppm)	35 ± 4	2.2 ± 0.3
Ge (ppm)	47 ± 5	—
As (ppm)	20 ± 4	2.4 ± 0.3
Mo (ppm)	4.6 ± 0.5	31 ± 3
Ru (ppm)	0.4 ± 0.1	0.8 ± 0.1
Rh (ppm)	0.7 ± 0.1	0.7 ± 0.1
Pd (ppm)	1.6 ± 0.6	2.5 ± 0.1
Sb (ppm)	0.19 ± 0.04	0.04 ± 0.01
W (ppm)	0.06 ± 0.02	0.046 ± 0.008
Re (ppm)	0.009 ± 0.006	0.0011 ± 0.0004
Os (ppm)	0.12 ± 0.03	0.0020 ± 0.0006
Ir (ppm)	0.11 ± 0.02	0.0008 ± 0.0004
Pt (ppm)	0.24 ± 0.05	0.002 ± 0.001
Au (ppm)	1.16 ± 0.32	0.023 ± 0.015

Table 2. Experimental partitioning results from the Fe-Ni-P system. All errors are ±2σ.

Run #	LB14	LB16	LB19	LB21	R1P1	R5P4	R2P8	R2P9
Temperature (°C)	1100	1075	1100	1100	1100	1075	1000	950
Duration (hours)	22	22	72	144	72	96	120	144
P-rich melt								
Fe (wt%)	89.6 ± 0.7	88.2 ± 2.2	88.2 ± 2.3	88.8 ± 2.0	74.6 ± 0.9	65.9 ± 1.1	51.4 ± 1.8	42.2 ± 1.0
P (wt%)	11.1 ± 1.5	11.3 ± 1.5	12.1 ± 2.1	12.2 ± 1.6	13.9 ± 2.2	13.5 ± 1.8	12.1 ± 1.8	12.0 ± 1.6
Ni (wt%)	—	—	—	—	10.9 ± 2.7	21.4 ± 1.6	33.6 ± 2.9	42.3 ± 1.7
V (ppm)	—	8.9 ± 1	—	—	11 ± 3	22 ± 3	7.2 ± 0.2	3.5 ± 0.4
Co (ppm)	134 ± 32	113 ± 21	122 ± 29	129 ± 16	294 ± 16	454 ± 18	645 ± 49	732 ± 45
Cu (ppm)	428 ± 178	275 ± 61	319 ± 35	231 ± 70	391 ± 66	620 ± 103	455 ± 77	216 ± 27
Zn (ppm)	—	—	—	—	53 ± 17	151 ± 47	120 ± 56	63 ± 6
Ga (ppm)	57 ± 10	25 ± 6	43 ± 3	35 ± 6	58 ± 13	68 ± 5	96 ± 22	58 ± 23
Ge (ppm)	180 ± 45	201 ± 43	168 ± 13	228 ± 45	127 ± 29	140 ± 16	180 ± 29	151 ± 67
As (ppm)	178 ± 110	215 ± 75	211 ± 51	220 ± 86	166 ± 37	294 ± 83	283 ± 96	225 ± 98
Mo (ppm)	117 ± 38	110 ± 18	122 ± 11	121 ± 21	155 ± 8	183 ± 8	260 ± 7	245 ± 32
Ru (ppm)	103 ± 20	94 ± 9	111 ± 12	94 ± 5	123 ± 13	157 ± 20	165 ± 9	147 ± 13
Rh (ppm)	95 ± 24	87 ± 2	84 ± 11	89 ± 10	91 ± 5	111 ± 0.2	145 ± 5	115 ± 11
Pd (ppm)	114 ± 84	109 ± 38	141 ± 13	163 ± 64	142 ± 37	188 ± 7	230 ± 68	160 ± 66
Ag (ppm)	—	15 ± 13	223 ± 205	—	311 ± 249	315 ± 123	553 ± 124	406 ± 189
W (ppm)	59 ± 10	69 ± 5	68 ± 15	63 ± 6	61 ± 1	76 ± 3	94 ± 7	83 ± 12
Re (ppm)	85 ± 23	90 ± 22	67 ± 12	84 ± 21	76 ± 12	110 ± 12	116 ± 16	85 ± 12
Os (ppm)	71 ± 17	94 ± 29	84 ± 30	86 ± 30	72 ± 15	87 ± 9	92 ± 7	70 ± 13
Ir (ppm)	130 ± 32	167 ± 50	116 ± 27	145 ± 49	119 ± 15	123 ± 3	153 ± 5	115 ± 23
Pt (ppm)	120 ± 26	167 ± 35	118 ± 33	144 ± 32	87 ± 18	91 ± 10	110 ± 13	87 ± 25
Au (ppm)	—	265 ± 166	224 ± 33	208 ± 111	210 ± 102	315 ± 76	377 ± 88	389 ± 219
Schreibersite								
Fe (wt%)	84.8 ± 2.7	84.6 ± 2.3	84.9 ± 1.3	84.9 ± 1.8	75.9 ± 2.1	69.0 ± 0.9	55.3 ± 1.8	44.1 ± 0.7
P (wt%)	15.2 ± 2.0	15.4 ± 2.0	16.5 ± 2.1	15.6 ± 2.0	15.8 ± 2.1	15.7 ± 2.0	15.6 ± 2.0	15.6 ± 2.0
Ni (wt%)	—	—	—	—	8.3 ± 2.1	15.4 ± 0.9	26.5 ± 1.1	36.9 ± 0.9
V (ppm)	—	13 ± 3	2.5 ± 1.7	—	18 ± 0.9	24 ± 2	7.9 ± 2	4.2 ± 0.8
Co (ppm)	—	83 ± 6	—	—	307 ± 30	346 ± 42	540 ± 47	818 ± 77
Cu (ppm)	—	91 ± 42	98 ± 44	62 ± 7	131 ± 8	120 ± 6	121 ± 11	63 ± 6

Table 2. *Continued*. Experimental partitioning results from the Fe-Ni-P system. All errors are ±2σ.

Run #	LB14	LB16	LB19	LB21	R1P1	R5P4	R2P8	R2P9
Zn (ppm)	—	—	—	—	—	—	—	7.9 ± 5
Ga (ppm)	7.2 ± 6.3	5.4 ± 5.2	4.2 ± 1.2	4.1 ± 0.1	4.7 ± 1	4.3 ± 1	4.8 ± 1	5.4 ± 2
Ge (ppm)	22 ± 21	—	14 ± 12	12 ± 8	13 ± 2	14 ± 1	17 ± 4	20 ± 3
As (ppm)	48 ± 45	—	32 ± 24	27 ± 1	25 ± 2	25 ± 0.8	34 ± 7	29 ± 3
Mo (ppm)	—	89 ± 17	93 ± 14	95 ± 12	137 ± 21	128 ± 4	221 ± 45	239 ± 22
Ru (ppm)	91 ± 15	76 ± 10	100 ± 13	101 ± 4	166 ± 26	136 ± 14	165 ± 30	134 ± 11
Rh (ppm)	56 ± 9	55 ± 11	49 ± 6	51 ± 6	82 ± 16	67 ± 6	110 ± 20	87 ± 15
Pd (ppm)	29 ± 5	36 ± 23	29 ± 12	31 ± 4	36 ± 3	34 ± 4	40 ± 10	39 ± 3
Ag (ppm)	—	—	5.6 ± 2.3	3.6 ± 0.6	4.5 ± 0.7	—	7.8 ± 3	10 ± 5
W (ppm)	46 ± 10	57 ± 8	65 ± 11	63 ± 4	69 ± 10	88 ± 7	101 ± 20	86 ± 9
Re (ppm)	56 ± 14	48 ± 13	55 ± 10	71 ± 2	95 ± 14	157 ± 5	111 ± 34	87 ± 20
Os (ppm)	33 ± 3	32 ± 14	46 ± 9	35 ± 6	59 ± 21	90 ± 11	103 ± 30	107 ± 16
Ir (ppm)	35 ± 4	37 ± 29	33 ± 10	35 ± 1	64 ± 12	66 ± 8	79 ± 19	63 ± 7
Pt (ppm)	14 ± 4	—	12 ± 4	12 ± 1	20 ± 5	25 ± 2	21 ± 5	19 ± 4
Au (ppm)	—	—	3.1 ± 1.9	2.1 ± 0.4	3.7 ± 0.9	4.0 ± 1	4.3 ± 1	3.3 ± 0.9
D(schreibersite)/(P-rich melt)								
P	1.37 ± 0.26	1.36 ± 0.25	1.32 ± 0.28	1.35 ± 0.25	1.13 ± 0.23	1.17 ± 0.22	1.29 ± 0.25	1.30 ± 0.24
Ni	—	—	—	—	0.77 ± 0.27	0.72 ± 0.07	0.79 ± 0.08	0.87 ± 0.04
V	—	1.47 ± 0.44	—	—	1.64 ± 0.46	1.09 ± 0.17	1.10 ± 0.22	1.20 ± 0.26
Co	—	0.73 ± 0.14	—	—	1.04 ± 0.12	0.76 ± 0.10	0.84 ± 0.10	1.12 ± 0.13
Cu	—	0.33 ± 0.17	0.31 ± 0.14	0.27 ± 0.09	0.34 ± 0.06	0.19 ± 0.03	0.27 ± 0.05	0.29 ± 0.05
Zn	—	—	—	—	—	—	—	0.13 ± 0.07
Ga	0.13 ± 0.11	—	0.10 ± 0.03	0.12 ± 0.02	0.08 ± 0.03	0.06 ± 0.02	0.05 ± 0.02	0.09 ± 0.05
Ge	—	—	0.09 ± 0.07	0.05 ± 0.03	0.10 ± 0.03	0.10 ± 0.01	0.09 ± 0.03	0.13 ± 0.06
As	—	—	0.15 ± 0.12	0.12 ± 0.05	0.15 ± 0.04	0.09 ± 0.02	0.12 ± 0.05	0.13 ± 0.06
Mo	—	0.81 ± 0.20	0.76 ± 0.13	0.79 ± 0.17	0.88 ± 0.14	0.70 ± 0.04	0.85 ± 0.18	0.98 ± 0.16
Ru	0.88 ± 0.23	0.81 ± 0.14	0.89 ± 0.15	1.07 ± 0.07	1.35 ± 0.25	0.87 ± 0.14	1.00 ± 0.19	0.91 ± 0.11
Rh	0.59 ± 0.18	0.63 ± 0.13	0.58 ± 0.11	0.57 ± 0.09	0.90 ± 0.19	0.60 ± 0.06	0.76 ± 0.14	0.76 ± 0.15
Pd	0.26 ± 0.19	0.33 ± 0.24	0.21 ± 0.08	0.19 ± 0.08	0.25 ± 0.07	0.18 ± 0.02	0.17 ± 0.07	0.24 ± 0.10
Ag	—	—	—	—	0.014 ± 0.012	—	0.014 ± 0.006	0.03 ± 0.02

Table 2. *Continued*. Experimental partitioning results from the Fe-Ni-P system. All errors are ±2σ.

Run #	LB14	LB16	LB19	LB21	R1P1	R5P4	R2P8	R2P9
W	0.78 ± 0.22	0.82 ± 0.13	0.96 ± 0.27	1.00 ± 0.11	1.13 ± 0.16	1.16 ± 0.11	1.07 ± 0.23	1.04 ± 0.19
Re	0.66 ± 0.24	0.53 ± 0.19	0.83 ± 0.21	0.84 ± 0.21	1.25 ± 0.27	1.43 ± 0.16	0.96 ± 0.32	1.02 ± 0.27
Os	0.46 ± 0.12	0.34 ± 0.18	0.55 ± 0.22	0.40 ± 0.16	0.82 ± 0.34	1.03 ± 0.16	1.12 ± 0.33	1.53 ± 0.37
Ir	0.27 ± 0.07	0.22 ± 0.19	0.29 ± 0.11	0.24 ± 0.08	0.54 ± 0.12	0.54 ± 0.06	0.52 ± 0.13	0.55 ± 0.12
Pt	0.11 ± 0.04	—	0.11 ± 0.04	0.08 ± 0.02	0.23 ± 0.07	0.27 ± 0.04	0.19 ± 0.05	0.22 ± 0.08
Au	—	—	0.014 ± 0.009	0.010 ± 0.006	0.02 ± 0.01	0.013 ± 0.006	0.010 ± 0.004	0.008 ± 0.005

Table 3. Experimental partitioning results compared to Twannberg results.

Element	Weighted average* D (schreibersite)/(P-rich melt)	Calculated** D (schreibersite)/(solid metal)	Twannberg*** D (schreibersite)/(solid metal)
P	1.25 ± 0.11	10.07 (1.12, 0.91)	64 ± 19
Ni	0.83 ± 0.03	0.94 (0.02, 0.02)	3.3 ± 0.4
V	1.15 ± 0.12	—	—
Co	0.91 ± 0.06	0.67 (0.20, 0.12)	0.32 ± 0.03
Cu	0.24 ± 0.02	0.16 (0.06, 0.04)	—
Zn	0.13 ± 0.07	—	—
Ga	0.07 ± 0.01	0.011 (0.006, 0.003)	0.06 ± 0.01
Ge	0.100 ± 0.009	0.019 (0.005, 0.004)	—
As	0.11 ± 0.02	0.09 (0.02, 0.01)	0.12 ± 0.03
Mo	0.74 ± 0.04	3.14 (0.94, 0.66)	6.71 ± 0.98
Ru	0.94 ± 0.07	0.50 (0.21, 0.13)	1.91 ± 0.55
Rh	0.65 ± 0.05	0.46 (0.14, 0.09)	0.96 ± 0.22
Pd	0.19 ± 0.02	0.23 (0.06, 0.04)	1.60 ± 0.60
Ag	0.015 ± 0.005	0.13 (0.10, 0.03)	—
W	1.11 ± 0.07	0.83 (0.34, 0.22)	0.74 ± 0.27
Re	1.16 ± 0.10	0.10 (0.05, 0.030)	0.12 ± 0.09
Os	0.94 ± 0.11	0.033 (0.027, 0.012)	0.017 ± 0.007
Ir	0.50 ± 0.04	0.20 (0.009, 0.005)	0.007 ± 0.004
Pt	0.20 ± 0.02	0.012 (0.006, 0.003)	0.009 ± 0.006
Au	0.011 ± 0.003	0.006 (0.001, 0.001)	0.02 ± 0.01

* Weighted average calculated from experiments LB19, R1P1, R5P4, R2P8, and R2P9, with ±2σ errors.

** Calculated using the weighted average from the first column and the solid metal/P-rich melt parametrizations of Chabot et al. (2017). Listed with ±2σ errors (-2σ error, +2σ error) derived from uncertainties from both the weighted average in the first column and the uncertainties of the published Chabot et al. (2017) parameterizations.

*** Twannberg errors are ±1σ.

Table S1. Twannberg results from this study compared to previous Twannberg results. All errors are ±1σ.

Element	Schreibersite		Solid metal			
	This study	Hofmann et al. (2009)	This study	Wasson et al. (2009)	Hofmann et al. (2009)**	
					TW I	TW II
Fe (wt%)	71.2 ± 0.9	75.1 ± 0.4	93.6 ± 0.7	—	95.4	95.5
P (wt%)	15.3 ± 2.0	15.1 ± 0.01	0.24 ± 0.07	2.0*	—	—
Ni (wt%)	11.7 ± 0.3	10.5 ± 0.2	3.5 ± 0.5	4.46	4.31	4.79
Co (wt%)	0.147 ± 0.007	0.06 ± 0.02	0.46 ± 0.03	0.52	0.512	0.517
Ga (ppm)	2.2 ± 0.3	—	35 ± 4	37.6	32.0	32.5
Ge (ppm)	—	—	47 ± 5	51.4	48	47
As (ppm)	2.4 ± 0.3	—	20 ± 4	17.8	16.9	17.6
Mo (ppm)	31 ± 3	—	4.6 ± 0.5	—	—	—
Ru (ppm)	0.8 ± 0.1	—	0.4 ± 0.1	—	—	—
Rh (ppm)	0.7 ± 0.1	—	0.7 ± 0.1	—	—	—
Pd (ppm)	2.5 ± 0.1	—	1.6 ± 0.6	—	—	—
Sb (ppm)	0.04 ± 0.01	—	0.19 ± 0.04	0.163	0.135	0.146
W (ppm)	0.046 ± 0.008	—	0.06 ± 0.02	0.13	0.10	0.15
Re (ppm)	0.0011 ± 0.0004	—	0.009 ± 0.006	<0.02	0.01	0.012
Os (ppm)	0.0020 ± 0.0006	—	0.12 ± 0.03	—	—	—
Ir (ppm)	0.0008 ± 0.0004	—	0.11 ± 0.02	0.092	0.22	0.34
Pt (ppm)	0.002 ± 0.001	—	0.24 ± 0.05	1.1	0.24	0.22
Au (ppm)	0.023 ± 0.015	—	1.16 ± 0.32	1.364	1.05	1.04

*Value for P is from modal analyses.

**Data collected for two sections: Twannberg I (TW I) and Twannberg II (TW II).

Table S2. Experimental starting compositions for the Fe-Ni-P system.

Run #	LB14, 16, 19, 21	R1P1	R5P4	R2P8	R2P9
Composition					
Fe (wt%)	83.79	73.35	63.51	53.52	43.70
P (wt%)	15.94	16.21	16.13	16.15	16.03
Ni (wt%)	—	10.17	20.04	29.93	39.92
E-mix (wt%)*	0.27	0.28	0.31	0.40	0.35

*Powders in E-mix: V, Cr_2O_3, Mn, Co, Ni, Cu, Zn, Ga, Ge, As, Mo, Ru, Rh, Pd, Ag_2O, Sn, Sb, H_2WO_4, Re, Os, Ir, Pt, Au, PbO, Bi. Each trace element powder has roughly equal amounts by weight in the combined E-mix powder.

Table S3. Experimental partitioning results containing $(Fe,Ni)_2P$. All errors are ±2σ.

Run #	R1P5	R1P8
Temperature (°C)	1100	1100
Duration (hours)	96	48
P-rich melt		
Fe (wt%)	65.5 ± 1.3	53.3 ± 1.7
P (wt%)	16.1 ± 2.1	16.4 ± 2.1
Ni (wt%)	19.7 ± 0.4	28.7 ± 1.1
V(ppm)	12 ± 1	20 ± 4
Co (ppm)	530 ± 20	712 ± 63
Cu (ppm)	318 ± 7	279 ± 52
Ga (ppm)	31 ± 6	7.6 ± 1.2
Ge (ppm)	121 ± 15	136 ± 4
As (ppm)	181 ± 21	191 ± 14
Mo (ppm)	253 ± 11	285 ± 45
Ru (ppm)	190 ± 18	230 ± 7
Rh (ppm)	118 ± 4	134 ± 10
Pd (ppm)	102 ± 10	139 ± 48
Ag (ppm)	19 ± 4	97 ± 69
Sn (ppm)	295 ± 39	345 ± 163
Sb (ppm)	219 ± 44	363 ± 162
W (ppm)	90 ± 5	107 ± 5
Re (ppm)	124 ± 12	114 ± 14
Os (ppm)	103 ± 6	84 ± 4
Ir (ppm)	130 ± 14	104 ± 4
Pt (ppm)	96 ± 14	75 ± 7
Au (ppm)	173 ± 31	157 ± 42
$(Fe,Ni)_2P$		
Fe (wt%)	64.3 ± 1.8	56.2 ± 1.3
P (wt%)	22.5 ± 2.9	22.0 ± 2.9
Ni (wt%)	14.0 ± 0.6	20.8 ± 0.9
V(ppm)	46 ± 2	46 ± 13
Co (ppm)	513 ± 33	713 ± 51
Cu (ppm)	50 ± 5	23 ± 6
Ga (ppm)	7.9 ± 0.5	3.9 ± 1.2
Ge (ppm)	37 ± 2	32 ± 8
As (ppm)	81 ± 12	52 ± 14
Mo (ppm)	539 ± 66	626 ± 55
Ru (ppm)	143 ± 16	189 ± 15
Rh (ppm)	54 ± 5	65 ± 3
Pd (ppm)	9.2 ± 1.5	11 ± 0.6
Ag (ppm)	0.3 ± 0.2	0.5 ± 0.2
Sn (ppm)	1.8 ±1.1	0.8 ± 0.3
Sb (ppm)	1.9 ± 0.5	1.3 ± 0.4
W (ppm)	89 ± 2	108 ± 5

Table S3. *Continued.* Experimental partitioning results containing $(Fe,Ni)_2P$. All errors are ±2σ.

Run #	R1P5	R1P8
Re (ppm)	26 ± 1	36 ± 2
Os (ppm)	17 ± 2	21 ± 1
Ir (ppm)	11 ± 1	14 ± 1
Pt (ppm)	0.9 ± 0.5	1.0 ± 0.3
Au (ppm)	1.2 ± 0.2	1.3 ± 0.5
D $((Fe,Ni)_2P)$/(P-rich melt)		
P	1.4 ± 0.3	1.3 ± 0.3
Ni	0.71 ± 0.03	0.73 ± 0.04
V	3.90 ± 0.45	2.32 ± 0.80
Co	0.97 ± 0.07	1.00 ± 0.11
Cu	0.16 ± 0.01	0.08 ± 0.03
Ga	0.25 ± 0.05	0.51 ± 0.18
Ge	0.31 ± 0.04	0.24 ± 0.06
As	0.45 ± 0.09	0.27 ± 0.08
Mo	2.13 ± 0.28	2.20 ± 0.40
Ru	0.75 ± 0.11	0.82 ± 0.07
Rh	0.46 ± 0.04	0.49 ± 0.04
Pd	0.09 ± 0.02	0.08 ± 0.03
Ag	0.02 ± 0.01	0.005 ± 0.004
Sn	0.006 ± 0.004	0.002 ± 0.001
Sb	0.009 ± 0.003	0.004 ± 0.002
W	0.99 ± 0.06	1.01 ± 0.07
Re	0.21 ± 0.02	0.32 ± 0.04
Os	0.17 ± 0.02	0.25 ± 0.02
Ir	0.08 ± 0.01	0.13 ± 0.01
Pt	0.009 ± 0.005	0.014 ± 0.005
Au	0.007 ± 0.002	0.008 ± 0.004

Table S4. Previous experimental partitioning D values for schreibersite/solid metal partitioning.

Element	(schreibersite)/Fe-Ni
Ni	1.0
As	0.16
Mo	3.9
Pd	0.78
Sb	0.045
Au	0.017

Data from Jones et al. (1993); Jones and Casanova (1993)