

RHODIUM AND PALLADIUM PARTITIONING BETWEEN COPPER-NICKEL-PYRRHOTITE AND SULFIDE LIQUID

EBEL, D. S., and CAMPBELL, A. J., Dept. Geophysical Sciences, University of Chicago, 5734 S. Ellis Ave., Chicago IL 60637, debel@midway.uchicago.edu and acampbel@midway.uchicago.edu

Partition coefficients for Rh and Pd between monosulfide solid solution (mss), (Fe,Ni,Cu,PGE)_{1-x}S, and sulfide liquid (matte) have been determined from experiments in which ~0.1g of simple sulfides doped with Rh or Pd were heated in silica tubes for several days, then quenched very rapidly, all using techniques of, and yielding major element contents of two-phase results highly consistent with, Ebel and Naldrett (1997). Multiple polished mss/matte interfaces were analyzed for PGE using the laser ablation ICP-MS facility at Chicago:

TABLE:

exp	PGE	Nominal bulk wt%				PGE in mss			PGE in matte			D(PGE) mss/matte	
		Fe	Ni	Cu	S	T(C)	n	ppm	1σ	n	ppm		1σ
PdN4	Pd	58.6	5.1	0	36.4	1100	12	1.99	0.44	12	30.47	6.48	0.065
PdC2	Pd	54.9	0.3	8.7	36.0	1100	6	4.35	0.38	6	204.1	9.97	0.021
RN2	Rh	58.8	5.1	0	36.1	1100	7	2.58	0.17	8	6.67	1.23	0.387
RN3b	Rh	47.2	14.7	0	38.1	1100	6	5.01	0.17	7	2.59	0.15	1.931
RC2	Rh	54.0	0.5	9.5	36.0	1100	8	1.29	0.46	8	0.69	0.46	1.877
RC1b	Rh	51.3	0.6	9.5	38.5	1100	7	29.04	1.95	12	8.78	1.24	3.307
RC3	Rh	57.0	0.6	3.2	39.1	1150	11	20.36	0.90	7	8.01	1.12	2.542
RC4	Rh	58.0	0.6	4.0	37.5	1150	20	15.71	0.51	15	11.52	1.06	1.364

Fleet et al. (1993) obtained major element equilibria broadly consistent with more recent work, and $D(\text{Rh})=3.0\pm 0.7$ and $D(\text{Pd})=0.21\pm 0.08$, at $\sim 1020^\circ\text{C}$, in seven experiments with 20 to 50 ppm of each of six PGEs, ~ 5 wt% Cu, Ni at ~ 24 or 7 wt%. Our results suggest D for Rh and Pd decrease with decreasing $f(\text{S}_2)$, and both Rh and Pd "prefer" matte when the degree of metallic bonding in the matte increases. A value of $2.5 < D(\text{Rh}) < 3.0$ is consistent with the natural buffering effects observed in magmatic Ni-PGE ores. Further work clearly will be required, to establish the major element dependence of these and other PGE mss/matte partition coefficients of geological interest.