

Determination of Ru and Os with enhanced sensitivity and Rh, Pd, Pt and Ir at sub ng g⁻¹ levels in geological samples by ICP-MS

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Fig. S1

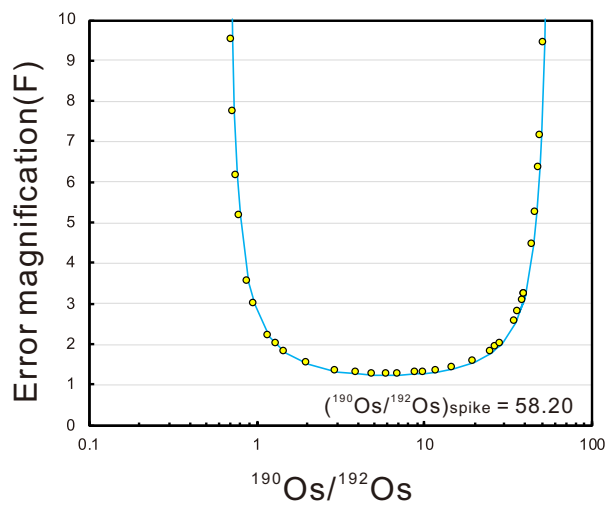
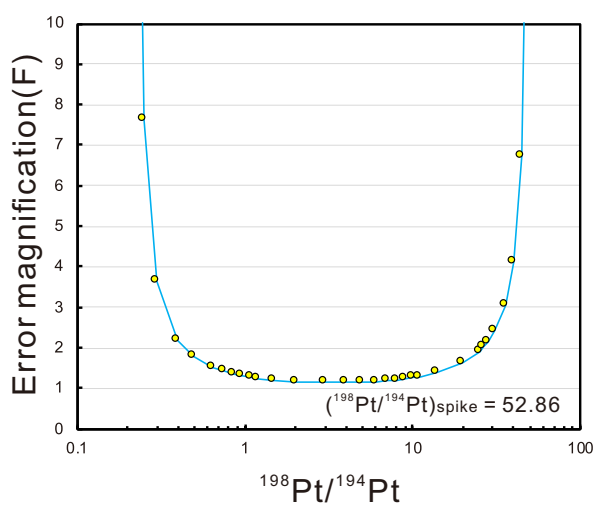
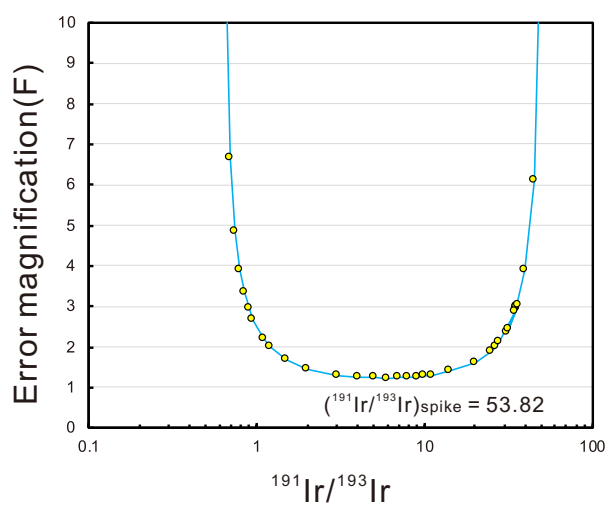
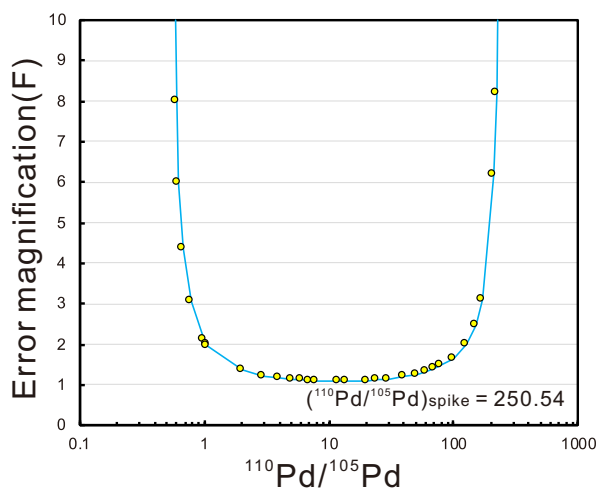
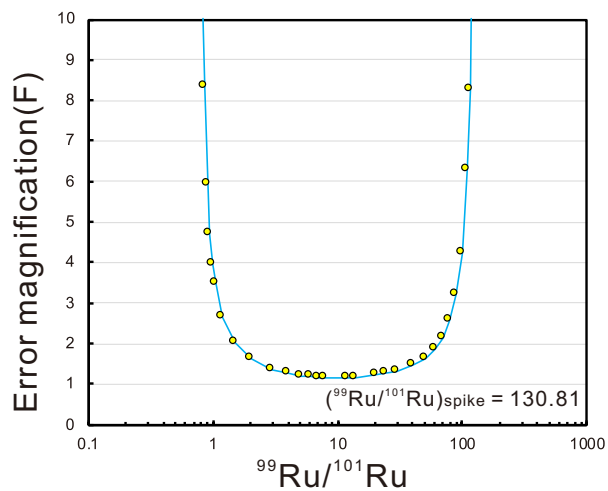


Table S1 Procedural recovery (%) of PGE analytes

No.	Ru	Rh	Pd	Os	Ir	Pt
1	85.6	67.6	69.4	95.4	38.5	67.4
2	81.6	58.1	62.3	88.8	47.8	57.6
3	85.7	53.8	55.4	94.6	37.1	53.4
Mean	84.3	59.9	62.4	92.9	41.1	59.5
SD	2.3	7.1	7.0	3.6	5.8	7.2

Note: The material GPt-1 with addition of PGE standards were fused and prepared. Ru and Os were measured by isotope dilution with the trapping solution of HBr with the spike. Rh-Pd-Ir-Pt were measured with the calibration curve method.

Table S2 Procedural blanks (ng) of PGE analytes

	Ru	Rh	Pd	Os	Ir	Pt
1	0.056	0.011	0.335	0.042	0.013	0.146
2	0.046	0.015	0.485	0.038	0.017	0.129
3	0.072	0.014	0.205	0.035	0.025	0.172
4	0.07	0.016	0.216	0.053	0.011	0.157
5	0.028	0.007	0.314	0.032	0.017	0.105
6	0.061	0.005	0.246	0.028	0.023	0.16
Mean	0.056	0.011	0.3	0.038	0.018	0.145
3SD	0.049	0.014	0.314	0.026	0.016	0.073

Table S3 Measured isotope ratios, error magnification (F) values, blank correction and relative uncertainties in ratio measurements and PGE contents for reference materials

Sample	Ru					
	Content (ng g ⁻¹)	dC/C(%)	F value	⁹⁹ Ru/ ¹⁰¹ Ru	dR/R(%)	Blank correction (%)
GPt-2	0.037	137	2.28	73.2	2.19	60.2
	0.045	120	2.17	70.3	1.84	55.3
	0.023	177	2.50	78.2	3.19	70.8
	0.036	194	2.59	80.2	12.29	75.0
	0.056	103	2.07	67.2	2.10	50.0
	0.030	154	2.38	75.6	2.85	64.8
	0.048	86	1.60	48.0	2.19	53.7
	0.027	118	1.75	55.4	1.85	67.4
	0.034	102	1.68	52.2	7.48	60.9
	0.021	128	1.77	56.5	1.93	72.3
TDB-1	0.331	23.2	1.59	47.9	2.54	14.5
	0.255	25.4	1.41	36.5	1.58	18.1
	0.398	14.6	1.19	15.9	1.46	12.3
	0.363	16.0	1.19	16.9	1.58	13.4
	0.396	14.7	1.19	15.6	1.12	12.4
	0.369	16.9	1.30	28.3	1.40	13.0
	0.244	22.8	1.24	22.2	0.88	18.4
	0.258	21.8	1.23	21.5	1.25	17.7
	0.226	24.5	1.25	22.8	1.27	19.7
	0.214	25.6	1.25	23.5	0.86	20.5
WGB-1	0.244	26.6	1.42	37.3	3.33	18.7
	0.252	22.5	1.23	21.6	1.27	18.2
	0.255	25.3	1.40	36.1	2.10	18.0
	0.265	24.3	1.39	35.2	1.00	17.5
	0.260	21.7	1.23	20.9	2.29	17.7
	0.220	25.3	1.25	23.3	0.41	20.3
	0.138	38.8	1.34	31.5	2.39	28.9
	0.137	38.8	1.34	31.6	0.54	28.9
	0.145	36.9	1.33	30.6	1.16	27.8
	0.135	38.8	1.33	30.9	1.72	29.1
GPt-7	0.946	7.0	1.26	24.1	0.47	5.57
	0.986	6.7	1.25	23.4	0.28	5.38
	0.736	8.5	1.20	17.4	0.88	7.08
	0.509	12.3	1.25	22.9	1.26	9.91
	0.513	12.1	1.24	22.6	1.31	9.72
	0.508	11.6	1.17	12.9	2.37	9.94
	0.527	11.3	1.17	12.6	4.22	9.64
	0.564	10.6	1.17	11.9	1.72	9.05
	0.708	8.4	1.16	9.83	1.00	7.20
	0.447	13.2	1.18	14.7	0.16	11.2

GPt-4	2.13	5.9	1.19	6.08	0.55	4.96
	2.74	4.8	1.22	4.99	6.86	3.92
	2.17	3.3	1.30	3.50	2.21	2.51
	2.82	2.7	1.37	2.89	4.06	1.95
	2.09	3.1	1.17	7.50	4.04	2.62
	2.14	3.0	1.17	7.33	2.29	2.55
	1.87	3.6	1.23	4.53	0.19	2.89
	1.92	3.5	1.24	4.46	0.22	2.82
	1.85	3.6	1.23	4.69	1.24	2.93
	1.73	3.8	1.22	4.96	0.71	3.13
DZΣ-1	11.1	0.8	1.57	2.10	1.68	0.51
	6.38	1.2	1.35	3.07	1.13	0.87
	9.33	0.9	1.49	2.34	0.46	0.60
	8.22	1.0	1.43	2.56	0.75	0.68
	7.07	1.1	1.37	2.88	0.52	0.79
	6.83	1.4	1.70	1.83	0.46	0.81
	8.16	1.2	1.84	1.66	0.24	0.68
	8.41	1.2	1.85	1.64	0.78	0.66
DZΣ-2	5.52	1.3	1.31	3.43	0.27	1.00
	5.73	1.3	1.32	3.30	0.56	0.97
	7.03	1.1	1.38	2.82	0.72	0.78
	5.93	1.2	1.32	3.25	0.78	0.93
	7.53	1.0	1.40	2.74	0.72	0.74
	6.31	1.4	1.64	1.94	0.32	0.88
	6.95	1.4	1.71	1.82	0.21	0.80
MUH-1	4.86	1.5	1.28	3.77	0.26	1.14
	6.66	1.1	1.36	2.98	0.32	0.84
	6.42	1.2	1.35	3.07	0.31	0.87
	8.02	1.0	1.42	2.60	0.91	0.70
	6.22	1.2	1.34	3.13	0.64	0.90
	8.25	1.0	1.43	2.55	1.16	0.67
	4.84	1.7	1.51	2.27	0.45	1.13
	4.75	1.7	1.51	2.26	0.13	1.14
	4.71	1.8	1.49	2.32	0.21	1.18
Harz01	11.1	0.8	1.57	2.10	1.59	0.50
	7.72	1.0	1.41	2.69	0.57	0.73
	7.82	1.0	1.42	2.64	0.29	0.71
	4.44	1.6	1.26	4.03	0.85	1.24
	8.77	0.9	1.46	2.45	0.85	0.64
	9.17	0.9	1.48	2.36	0.81	0.61
	5.34	1.3	1.30	3.54	0.43	1.04
	6.30	1.4	1.65	1.92	0.21	0.87

Sample	Pd					
	Content (ng g ⁻¹)	dC/C(%)	F value	¹¹⁰ Pd/ ¹⁰⁵ Pd	dR/R(%)	Blank correction (%)
GPt-2	2.69	11.4	1.14	4.86	1.88	10.0
	2.31	12.9	1.13	5.49	2.84	11.5
	2.41	12.6	1.13	5.36	1.31	11.1
	2.50	20.9	1.10	8.58	6.27	19.0
	2.99	10.5	1.15	4.47	2.68	9.16
	2.80	11.1	1.15	4.69	4.77	9.67
	2.79	11.1	1.14	4.74	1.39	9.70
	2.68	11.6	1.15	4.51	1.15	10.0
	2.78	10.6	1.14	5.08	2.01	9.33
	2.91	10.6	1.14	4.70	1.88	9.24
TDB-1	24.3	2.44	1.99	1.06	1.08	1.23
	30.9	2.16	2.24	0.95	1.20	0.97
	28.3	2.24	2.13	0.99	1.75	1.05
	22.3	2.57	1.93	1.09	2.07	1.33
	20.0	2.72	1.84	1.15	1.45	1.48
	23.4	2.49	1.99	1.06	2.06	1.25
	22.5	2.39	1.85	1.15	0.79	1.29
	24.9	2.40	2.03	1.04	1.09	1.18
	36.8	1.94	2.42	0.89	0.90	0.80
	34.2	2.00	2.34	0.92	0.73	0.85
WGB-1	14.7	3.22	1.60	1.40	1.71	2.00
	23.5	2.50	1.97	1.07	1.91	1.26
	9.67	4.27	1.42	1.80	1.56	3.01
	11.5	3.81	1.49	1.61	0.45	2.55
	13.3	3.44	1.57	1.46	1.61	2.20
	11.8	3.72	1.51	1.57	1.14	2.47
	12.2	3.69	1.54	1.51	1.18	2.39
	10.2	4.09	1.45	1.72	2.36	2.83
	11.0	3.84	1.46	1.68	0.40	2.63
	11.0	3.79	1.44	1.73	0.39	2.63
GPt-7	22.2	2.54	1.92	1.10	1.45	1.33
	23.2	2.49	1.95	1.08	0.59	1.28
	25.3	2.37	2.02	1.04	0.80	1.17
	21.9	2.55	1.89	1.12	1.21	1.35
	25.2	2.34	2.02	1.04	2.79	1.16
	17.6	2.91	1.74	1.24	0.96	1.67
	24.1	2.52	2.04	1.03	0.83	1.24
	21.6	2.61	1.90	1.11	1.84	1.37
	18.9	2.77	1.81	1.18	0.42	1.54
	24.0	2.53	2.04	1.03	1.03	1.24

GPt-4	62.8	2.15	2.29	0.93	1.03	0.94
	93.0	1.85	2.89	0.80	0.34	0.64
	91.3	1.50	4.6	0.67	0.66	0.33
	69.8	1.60	3.7	0.72	0.46	0.43
	71.2	1.61	3.8	0.71	1.53	0.42
	116	1.44	5.6	0.64	0.96	0.26
	63.1	1.70	3.6	0.73	0.75	0.47
	57.5	1.75	3.4	0.75	1.82	0.52
	71.8	1.49	3.6	0.73	0.22	0.41
	68.6	1.68	3.9	0.71	0.61	0.43
DZ Σ -1	6.23	5.86	1.27	2.54	0.74	4.61
	4.51	7.51	1.20	3.27	4.18	6.24
	4.36	7.72	1.20	3.35	3.75	6.44
	4.93	7.01	1.22	3.06	3.66	5.75
	4.98	7.00	1.22	3.04	1.66	5.73
	4.32	7.80	1.21	3.26	2.33	6.47
	4.32	7.81	1.21	3.25	2.07	6.48
	5.52	6.47	1.25	2.72	0.63	5.17
DZ Σ -2	1.28	20.9	1.10	8.64	3.36	19.0
	1.06	24.2	1.10	9.91	7.53	22.0
	1.07	23.8	1.10	9.77	2.94	21.7
	1.67	16.9	1.11	7.04	3.57	15.2
	1.45	19.0	1.10	7.92	2.74	17.2
	1.37	19.8	1.10	7.97	1.46	17.9
	1.55	18.0	1.11	7.35	3.27	16.2
	MUH-1	12.8	3.49	1.53	1.54	1.39
14.2		3.28	1.58	1.44	1.60	2.08
19.4		2.73	1.78	1.20	2.26	1.53
9.20		4.38	1.38	1.92	3.94	3.17
8.32		4.76	1.36	2.02	3.29	3.50
12.4		3.56	1.51	1.56	1.81	2.35
10.6		3.96	1.46	1.68	1.17	2.71
12.5		3.54	1.55	1.50	1.57	2.29
9.88		4.22	1.43	1.78	1.72	2.96
Harz01		8.31	4.72	1.35	2.06	0.52
	6.56	5.64	1.28	2.46	1.24	4.40
	6.44	5.73	1.29	2.40	0.90	4.44
	7.27	5.18	1.31	2.27	1.97	3.95
	7.89	4.90	1.33	2.15	2.05	3.67
	7.94	4.87	1.34	2.11	2.86	3.64
	5.60	6.35	1.25	2.77	2.64	5.10
	4.97	6.95	1.23	2.91	1.03	5.64

Sample	Os					
	Content (ng g ⁻¹)	dC/C(%)	F value	¹⁹⁰ Os/ ¹⁹² Os	dR/R(%)	Blank correction (%)
GPt-2	0.063	50.0	1.33	12.54	0.50	37.6
	0.033	78.1	1.46	17.17	0.09	53.6
	0.062	50.6	1.33	12.66	1.52	38.0
	0.014	149	1.78	25.06	2.96	83.6
	0.074	44.2	1.30	11.44	0.83	33.9
	0.041	67.8	1.41	15.60	0.43	48.1
	0.087	37.5	1.24	5.72	0.10	30.3
	0.108	32.4	1.24	5.08	1.48	26.1
	0.134	26.8	1.26	4.29	0.50	21.4
	0.026	75.2	1.28	10.02	0.95	58.9
TDB-1	0.492	8.95	1.24	4.99	0.31	7.21
	0.231	17.6	1.24	5.22	0.74	14.2
	0.238	18.3	1.33	3.00	0.33	13.8
	0.228	18.9	1.32	3.06	0.16	14.3
	0.262	17.2	1.35	2.77	0.65	12.7
	0.220	19.3	1.33	2.98	0.47	14.5
	0.220	19.1	1.32	3.13	0.76	14.5
	0.120	29.8	1.25	4.71	1.44	23.9
	0.331	14.5	1.42	2.35	1.46	10.2
	0.305	15.3	1.40	2.46	0.90	10.9
WGB-1	0.705	7.33	1.43	2.32	0.47	5.14
	0.532	10.73	1.60	1.77	0.84	6.70
	0.687	9.37	1.79	1.49	0.64	5.24
	0.570	10.44	1.67	1.65	0.56	6.26
	0.849	8.23	1.92	1.36	0.28	4.28
	0.760	8.74	1.84	1.44	1.23	4.76
	0.805	8.34	1.85	1.42	0.20	4.50
	0.533	10.55	1.59	1.79	0.63	6.62
	0.625	9.59	1.68	1.63	0.46	5.71
	0.567	10.27	1.65	1.69	0.45	6.24
GPt-7	0.990	4.93	1.34	2.89	0.57	3.68
	1.157	4.38	1.38	2.59	1.18	3.18
	0.832	6.51	1.49	2.07	1.12	4.37
	0.636	7.88	1.40	2.47	0.65	5.64
	0.636	7.79	1.40	2.45	1.04	5.56
	0.622	9.76	1.69	1.61	0.54	5.76
	0.640	9.63	1.71	1.58	0.38	5.62
	0.665	9.40	1.74	1.55	0.87	5.42
	0.749	8.69	1.83	1.44	0.92	4.74
	0.593	9.94	1.65	1.69	0.22	6.04

GPt-4	2.80	4.95	1.88	1.39	1.12	2.63
	3.26	4.58	2.02	1.29	0.14	2.27
	2.61	3.71	2.59	1.05	1.10	1.43
	3.10	3.48	2.88	0.99	0.60	1.21
	2.47	3.46	2.27	1.16	0.84	1.52
	2.47	3.45	2.27	1.16	1.35	1.52
	2.49	5.36	3.6	0.89	0.41	1.50
	2.46	5.37	3.5	0.90	0.19	1.52
	2.20	5.44	3.2	0.94	0.40	1.69
	2.15	5.47	3.2	0.94	0.60	1.73
DZ Σ -1	6.68	2.54	4.5	0.83	0.29	0.57
	5.29	2.68	3.8	0.88	0.80	0.71
	6.67	2.52	4.5	0.83	0.71	0.57
	5.55	2.63	3.9	0.87	0.65	0.68
	4.69	2.72	3.3	0.92	0.15	0.81
	4.10	4.77	5.2	0.80	0.07	0.92
	5.21	4.57	6.3	0.76	0.14	0.72
	5.51	4.52	6.6	0.76	0.48	0.69
DZ Σ -2	4.28	2.84	3.2	0.94	0.79	0.88
	4.54	2.80	3.4	0.92	1.24	0.83
	7.39	2.46	4.9	0.81	0.65	0.50
	3.61	2.95	2.84	1.00	1.42	1.04
	6.94	2.46	4.5	0.83	0.18	0.55
	4.36	4.66	5.4	0.79	0.32	0.86
	6.42	4.43	7.5	0.74	0.20	0.59
MUH-1	3.69	2.99	2.94	0.98	0.43	1.02
	4.38	2.84	3.3	0.93	0.92	0.87
	4.41	2.83	3.3	0.93	0.11	0.86
	5.17	2.69	3.7	0.89	0.81	0.73
	4.32	2.83	3.2	0.94	0.26	0.88
	4.40	2.76	3.2	0.93	0.28	0.85
	3.48	4.88	4.6	0.82	0.20	1.07
	3.69	4.85	4.9	0.81	0.24	1.00
	3.72	4.86	4.8	0.81	0.50	1.02
Harz01	8.71	2.40	5.5	0.79	0.51	0.44
	6.78	2.53	4.5	0.83	0.26	0.56
	4.85	2.75	3.5	0.90	0.33	0.78
	3.64	2.99	2.91	0.98	0.69	1.03
	6.06	2.58	4.1	0.85	1.09	0.62
	6.17	2.54	4.1	0.85	0.81	0.61
	4.41	2.76	3.2	0.94	1.06	0.86
	4.87	4.60	6.0	0.77	0.81	0.77

Sample	Ir					
	Content (ng g ⁻¹)	dC/C(%)	F value	¹⁹¹ Ir/ ¹⁹³ Ir	dR/R(%)	Blank correction (%)
GPt-2	0.046	54.6	1.94	25.8	11.0	28.1
	0.022	113	2.50	32.1	12.1	45.3
	0.031	83.1	2.24	29.6	6.98	37.1
	0.028	158	2.82	34.7	1.67	55.8
	0.044	57.8	1.97	26.2	12.0	29.3
	0.040	63.6	2.04	27.1	15.0	31.2
	0.496	4.32	1.24	5.96	4.26	3.50
	0.147	15.0	1.38	13.5	2.79	10.9
	0.107	21.4	1.55	18.3	11.0	13.8
	0.048	52.5	1.94	25.8	23.7	27.0
TDB-1	0.273	7.95	1.28	9.32	1.39	6.22
	0.114	20.4	1.49	16.8	4.25	13.7
	0.130	17.6	1.45	15.6	15.5	12.2
	0.154	14.5	1.39	13.7	6.87	10.5
	0.103	22.5	1.51	17.4	21.2	14.9
	0.100	22.9	1.52	17.5	14.8	15.1
	0.098	24.1	1.58	19.1	16.0	15.2
	0.089	26.2	1.57	18.9	12.2	16.7
	0.104	22.4	1.54	18.1	21.4	14.6
	0.122	18.7	1.48	16.4	20.7	12.7
WGB-1	0.311	6.93	1.26	8.51	4.35	5.49
	0.107	21.6	1.50	17.1	4.31	14.4
	0.193	11.3	1.33	11.7	14.1	8.52
	0.258	8.36	1.28	9.52	2.86	6.52
	0.209	10.4	1.32	11.1	11.8	7.92
	0.267	8.07	1.28	9.30	4.76	6.32
	0.279	7.68	1.27	8.75	12.4	6.06
	0.229	9.40	1.30	10.3	1.26	7.25
	0.234	9.24	1.30	10.5	4.34	7.10
	0.339	6.30	1.26	8.23	14.57	5.00
GPt-7	2.151	1.22	1.48	1.95	1.45	0.83
	2.194	1.21	1.48	1.93	0.86	0.81
	2.004	1.29	1.44	2.07	2.14	0.89
	2.165	1.21	1.47	1.96	2.46	0.82
	2.140	1.21	1.47	1.98	1.07	0.82
	1.935	1.33	1.44	2.07	3.02	0.92
	2.141	1.25	1.50	1.89	3.61	0.84
	2.046	1.28	1.46	2.00	4.40	0.87
	2.364	1.14	1.53	1.79	5.44	0.74
	2.042	1.30	1.48	1.95	2.94	0.88

GPt-4	7.484	0.85	1.78	1.38	0.99	0.48
	9.419	0.75	1.97	1.22	1.01	0.38
	9.298	0.54	2.82	0.93	1.98	0.19
	8.853	0.55	2.73	0.94	2.49	0.20
	7.587	0.59	2.50	1.00	0.91	0.24
	7.385	0.60	2.45	1.01	2.98	0.24
	7.522	0.61	2.55	0.98	2.98	0.24
	7.630	0.60	2.57	0.98	4.42	0.23
	8.875	0.52	2.59	0.97	1.90	0.20
	9.868	0.55	3.05	0.89	1.64	0.18
DZ Σ -1	2.100	1.25	1.46	2.01	3.62	0.85
	2.062	1.26	1.45	2.04	7.96	0.87
	2.462	1.11	1.53	1.81	1.65	0.73
	2.729	1.03	1.57	1.70	4.04	0.66
	2.066	1.26	1.45	2.05	3.44	0.87
	1.970	1.31	1.45	2.04	2.53	0.90
	2.327	1.16	1.52	1.82	0.77	0.77
	2.624	1.07	1.57	1.70	2.74	0.68
DZ Σ -2	3.033	0.96	1.63	1.58	2.03	0.59
	2.967	0.98	1.62	1.61	3.44	0.60
	2.100	1.23	1.46	1.99	3.24	0.84
	3.907	0.83	1.80	1.36	0.46	0.46
	6.606	0.63	2.30	1.06	1.16	0.27
	2.616	1.07	1.57	1.70	3.99	0.68
	3.645	0.87	1.77	1.40	5.45	0.49
MUH-1	3.655	0.86	1.75	1.42	2.05	0.49
	3.528	0.88	1.72	1.45	1.80	0.51
	2.952	0.98	1.61	1.62	2.90	0.61
	3.612	0.86	1.74	1.43	1.69	0.50
	3.874	0.84	1.81	1.36	1.39	0.47
	4.595	0.75	1.93	1.25	3.60	0.39
	3.027	0.97	1.66	1.54	1.40	0.58
	2.955	0.98	1.65	1.55	0.88	0.59
	2.661	1.07	1.58	1.68	1.75	0.67
Harz01	5.276	0.70	2.06	1.17	1.58	0.34
	3.660	0.86	1.75	1.42	2.48	0.49
	4.242	0.80	1.89	1.28	2.37	0.42
	3.829	0.83	1.78	1.38	2.79	0.47
	5.003	0.72	2.00	1.20	3.23	0.36
	4.457	0.77	1.91	1.27	3.54	0.40
	3.932	0.82	1.80	1.37	2.64	0.46
	5.457	0.70	2.14	1.13	1.03	0.33

Sample	Pt					
	Content (ng g ⁻¹)	dC/C(%)	F value	¹⁹⁸ Pt/ ¹⁹⁴ Pt	dR/R(%)	Blank correction (%)
GPt-2	1.96	8.00	1.16	5.78	0.90	6.88
	1.81	8.67	1.17	6.18	0.66	7.41
	1.91	8.25	1.16	5.96	3.07	7.08
	2.05	15.0	1.24	9.28	2.82	12.1
	1.99	7.91	1.16	5.70	1.85	6.82
	1.97	7.95	1.16	5.73	2.72	6.85
	2.04	7.70	1.16	5.62	1.90	6.64
	1.94	8.02	1.16	5.40	1.96	6.94
	2.07	7.31	1.16	5.93	2.09	6.28
	1.92	8.11	1.17	6.05	4.97	6.95
TDB-1	5.44	2.99	1.15	2.45	2.18	2.61
	5.38	3.01	1.14	2.50	1.53	2.63
	6.21	2.63	1.15	2.22	2.00	2.28
	5.24	3.09	1.15	2.49	3.94	2.70
	5.02	3.21	1.14	2.56	2.01	2.81
	5.32	3.00	1.15	2.41	3.77	2.61
	4.66	3.37	1.14	3.01	2.10	2.96
	4.35	3.64	1.14	2.92	1.65	3.19
	5.53	2.89	1.14	2.52	0.91	2.53
	4.76	3.31	1.14	2.83	2.51	2.91
WGB-1	3.55	4.48	1.14	3.54	0.27	3.94
	30.2	0.73	1.53	0.64	3.42	0.48
	4.63	3.46	1.14	2.75	1.76	3.04
	8.59	1.97	1.19	1.63	2.74	1.66
	3.77	4.21	1.14	3.28	4.65	3.70
	3.79	4.18	1.14	3.26	1.46	3.68
	5.60	2.90	1.15	2.27	2.15	2.52
	3.47	4.53	1.14	3.48	2.60	3.99
	7.40	2.23	1.17	1.90	2.77	1.91
	3.35	4.69	1.14	3.85	0.94	4.12
GPt-7	12.6	1.40	1.24	1.21	0.76	1.13
	13.6	1.33	1.26	1.14	0.77	1.06
	13.9	1.30	1.26	1.14	1.24	1.03
	16.6	1.12	1.30	0.99	1.09	0.86
	12.5	1.40	1.24	1.23	1.12	1.13
	13.5	1.34	1.26	1.14	1.40	1.06
	15.1	1.23	1.29	1.01	1.65	0.95
	13.1	1.38	1.25	1.17	2.74	1.10
	13.0	1.36	1.26	1.15	1.48	1.08
	12.4	1.45	1.25	1.17	2.38	1.16

GPt-4	45.1	0.89	1.40	0.78	0.46	0.64
	1992	0.26	18	0.23	0.23	0.01
	79.8	0.42	2.31	0.38	0.60	0.18
	282	0.29	5.6	0.26	0.29	0.05
	87.2	0.41	2.45	0.37	0.92	0.17
	58.6	0.49	1.98	0.44	0.58	0.25
	58.2	0.50	2.01	0.43	1.57	0.25
	57.5	0.50	2.00	0.44	0.81	0.25
	56.9	0.47	1.87	0.47	1.95	0.25
	61.7	0.49	2.09	0.42	0.69	0.23
DZ Σ -1	2.21	7.12	1.15	5.26	0.23	6.17
	1.75	8.98	1.17	6.39	1.90	7.65
	1.74	9.00	1.17	6.39	3.87	7.68
	2.83	5.59	1.14	4.34	3.46	4.90
	1.79	8.85	1.17	6.30	3.22	7.56
	3.36	4.69	1.14	3.60	3.18	4.12
	4.81	3.33	1.14	2.65	0.78	2.92
	2.82	5.60	1.14	4.21	5.66	4.91
DZ Σ -2	2.98	5.29	1.14	4.11	0.51	4.64
	2.71	5.81	1.14	4.47	6.32	5.08
	4.18	3.76	1.14	3.07	2.03	3.31
	6.04	2.70	1.15	2.25	1.51	2.34
	9.66	1.78	1.19	1.54	1.94	1.49
	5.82	2.79	1.15	2.27	2.15	2.43
	10.7	1.62	1.21	1.38	2.33	1.34
MUH-1	8.40	1.99	1.18	1.71	0.74	1.69
	8.40	2.01	1.18	1.73	1.26	1.71
	6.51	2.53	1.16	2.13	0.43	2.19
	6.38	2.57	1.15	2.17	2.82	2.23
	7.80	2.15	1.17	1.79	0.84	1.84
	10.3	1.67	1.21	1.44	1.03	1.39
	8.16	2.04	1.18	1.69	1.03	1.72
	8.06	2.04	1.18	1.69	3.29	1.73
	8.70	1.95	1.19	1.62	3.35	1.65
Harz01	10.4	1.66	1.21	1.44	1.01	1.38
	5.98	2.74	1.15	2.30	1.85	2.38
	7.86	2.13	1.18	1.75	2.38	1.81
	8.68	1.94	1.18	1.67	1.79	1.64
	12.7	1.40	1.24	1.23	2.39	1.13
	12.4	1.43	1.24	1.24	0.57	1.15
	5.74	2.84	1.15	2.38	1.06	2.47
	6.98	2.35	1.16	1.93	0.81	2.01

3.3 Determination of Rh

Following the standard calibration method, the calculation equation for Rh concentration $(C_{Rh})_s$ in resulting solutions is:

$$(C_{Rh})_s = \left(\frac{C_{Rh}}{C_{IS}} \times \frac{I_{IS}}{I_{Rh}} \right)_{std} \times \left(C_{IS} \times \frac{I_{Rh}}{I_{IS}} \right)_s \quad (1)$$

where the subscript Rh, s, std, and IS standard for Rh, resulting solution, standard and internal standard, respectively.

When ^{198}Pt was selected as internal standard for analysis of Rh, the concentration of ^{198}Pt $(C_{198})_s$ is equal to the following:

$$(C_{198})_s = \left(\frac{\Sigma M_{198}}{V} \right)_s \quad (2)$$

where V is the volume of the resulting solution, $(\Sigma M_{198})_s$ is the total mass of ^{198}Pt , which actually consists of two parts from the sample and the ^{198}Pt spike. Since the added quantity of the ^{198}Pt spike is known and the content of Pt in the sample can be determined by isotope dilution, the mass of ^{198}Pt $(\Sigma M_{198})_s$ can be computed by the followed equation:

$$(\Sigma M_{198})_s = (0.9176 \times M)_{spi} + (0.0716 \times M)_s \quad (3)$$

where the constants of 0.9176 and 0.0716 are the relative abundances of ^{198}Pt in the spike and in nature, respectively; M is the mass of Pt in the spike and in the sample.

By combining Equ. 1, 2 and 3, the content of Rh (C) in the sample (W) can be derived as follows:

$$C = \frac{V \times (C_{Rh})_s}{W} = \left(\frac{C_{Rh}}{C_{198}} \times \frac{I_{198}}{I_{Rh}} \right)_{std} \times \left(\frac{I_{Rh}}{I_{198}} \right)_s \times \frac{(0.9176 \times M)_{spi} + (0.0716 \times M)_s}{W} \quad (4)$$