Table S1. Summary of oxide interference in the determination of rare earth elements

Elements	Mass	Oxide interference	Mass resolution
La	139	$^{123}Sb^{16}O$	19225
		$^{123}Te^{16}O$	19386
Ce	140	$^{124}Sn^{16}O$	26616
		$^{124}Te^{16}O$	18182
Pr	141	$^{125}Te^{16}O$	16968
Nd	146	$^{130}Te^{16}O$	12177
		$^{130}Ba^{16}O$	12228
		$^{130}Xe^{16}O$	9925
Sm	147	$^{131}Xe^{16}O$	9853
Eu	151	$^{135}Ba^{16}O$	7832
	153	$^{137}Ba^{16}O$	7460
Gd	158	$^{142}Ce^{16}O$	7920
		$^{142}Nd^{16}O$	7225
Tb	159	$^{143}Nd^{16}O$	7711
Dy	163	$^{147}Sm^{16}O$	8615
Ho	165	$^{149}Sm^{16}O$	9051
Er	166	$^{150}Sm^{16}O$	9166
Tm	169	$^{153}Eu^{16}O$	9347
Yb	172	$^{156}Gd^{16}O$	8889
		$^{156}Dy^{16}O$	10006
Lu	175	$^{159}Tb^{16}O$	8524

Table S2. Summary of oxide interference of 21 isotopes that can be tested by LA-MC-ICP-MS.

Elements	Mass	Oxide interference	Mass resolution
Li	6		
	7		
B	10		
	11		
C	12		
	13		
Mg	24		
	25		
	26		
Si	28	$^{12}C^{16}O$	1557
	29	$^{13}C^{16}O$	1333

		$^{12}C^{17}O$	1281
	30	$^{12}C^{18}O$	1182
S	32	$^{16}O_2$	1803
	33	$^{16}O^{17}O$	1461
	34	$^{16}O^{18}O$	1298
	36	$^{20}Ne^{16}O$	1776
Cl	35	$^{16}O^{18}O^{1}H$	1059
		$^{19}F^{16}O$	1431
	37	$^{19}F^{18}O$	1169
		$^{21}Ne^{16}O$	1619
Ca	40	$^{24}Mg^{16}O$	2304
	42	$^{26}Mg^{16}O$	2223
		$^{24}Mg^{18}O$	1642
	43	$^{27}Al^{16}O$	2432
	44	$^{12}C^{16}O_2$	1281
		$^{14}N_2{}^{16}O$	966
		$^{28}Si^{16}O$	2689
	46	$^{14}N^{16}O_2$	1173
		$^{28}Si^{18}O$	2054
		$^{30}Si^{16}O$	3069
	48	$^{32}S^{16}O$	3322
Ti	46	$^{14}N^{16}O_2$	1143
		$^{15}N_2{}^{16}O$	1082
	47	$^{15}N^{16}O_2$	1231
		$^{31}P^{16}O$	2779
	48	$^{32}S^{16}O$	1948
	49	$^{32}S^{17}O$	2100
		$^{33}S^{16}O$	2649
		$^{31}P^{18}O$	1956
	50	$^{34}S^{16}O$	2779
		$^{32}S^{18}O$	1891
V	50	$^{34}S^{16}O$	3201
	51	$^{35}Cl^{16}O$	2576
Fe	54	$^{36}Ar^{18}O$	2995
	56	$^{40}Ar^{16}O$	2506
		$^{40}Ca^{16}O$	2482
	57	$^{40}Ar^{17}O$	2183
	58	$^{40}Ar^{18}O$	2052
Ni	58	$^{40}Ar^{18}O$	2215
		$^{40}Ca^{18}O$	2197
		$^{42}Ca^{16}O$	3190
	60	$^{44}Ca^{16}O$	120
	61	$^{45}Sc^{16}O$	3087
	62	$^{46}Ti^{16}O$	3231

	64	$^{48}Ti^{16}O$	4298
Cu	63	$^{47}Ti^{16}O$	3691
	65	$^{49}Ti^{16}O$	4336
Sr	84	$^{68}Zn^{16}O$	13270
	86	$^{70}Zn^{16}O$	7847
		$^{70}Ge^{16}O$	8696
	87	$^{71}Ga^{16}O$	8116
		$^{69}Ga^{18}O$	5489
	88	$^{72}Ge^{16}O$	7740
Zr	90	$^{74}Ge^{16}O$	7909
		$^{74}Se^{16}O$	7098
	91	$^{75}As^{16}O$	8372
	92	$^{76}Ge^{16}O$	8163
		$^{76}Se^{16}O$	10132
	94	$^{78}Kr^{16}O$	10456
		$^{78}Se^{16}O$	15959
	96	$^{80}Kr^{16}O$	31788
		$^{80}Se^{16}O$	30380
Sn	112	$^{96}Ru^{16}O$	37710
	114	$^{98}Ru^{16}O$	44186
	115	$^{99}Ru^{16}O$	46185
	116	$^{100}Ru^{16}O$	44444
	117	$^{101}Ru^{16}O$	47561
	118	$^{102}Ru^{16}O$	50213
		$^{102}Pd^{16}O$	108257
	119	$^{103}Rh^{16}O$	41034
	120	$^{100}Ru^{16}O$	64171
		$^{104}Pd^{16}O$	36810
	122	$^{106}Pd^{16}O$	24158
	124	$^{108}Pd^{16}O$	16940
Hf	174	$^{158}Gd^{16}O$	8266
	176	$^{160}Gd^{16}O$	9049
		$^{160}Dy^{16}O$	8259
	177	$^{161}Dy^{16}O$	8279
	178	$^{162}Dy^{16}O$	8095
		$^{162}Er^{16}O$	8896
	179	$^{163}Dy^{16}O$	8070
	180	$^{164}Dy^{16}O$	8011
		$^{164}Er^{16}O$	8021
Os	184	$^{168}Yb^{16}O$	7767
		$^{168}Er^{16}O$	7296
	186	$^{170}Yb^{16}O$	7695
		$^{170}Er^{16}O$	7928
	187	$^{171}Yb^{16}O$	7630

		$^{169}Tm^{18}O$	8359
	188	$^{172}Yb^{16}O$	7658
	189	$^{173}Yb^{16}O$	7551
	190	$^{174}Yb^{16}O$	7699
		$^{174}Hf^{16}O$	8092
	192	$^{176}Yb^{16}O$	8000
		$^{176}Hf^{16}O$	7631
		$^{176}Lu^{16}O$	8037
Pb	204	$^{188}Os^{16}O$	8979
	206	$^{190}Os^{16}O$	9768
	207	$^{191}Ir^{16}O$	10157
	208	$^{192}Pt^{16}O$	10058
		$^{192}Os^{16}O$	10277
Nd	142	$^{126}Te^{16}O$	14932
	143	$^{127}I^{16}O$	13710
	144	$^{128}Xe^{16}O$	12350
		$^{128}Te^{16}O$	13420
	145	$^{129}Xe^{16}O$	11249
		$^{127}I^{18}O$	16219
	146	$^{130}Ba^{16}O$	12228
		$^{130}Te^{16}O$	12177
	148	$^{132}Xe^{16}O$	8296
	150	$^{134}Xe^{16}O$	7285
		$^{134}Ba^{16}O$	6977
U	234		
	235		
	238		

Table S3. The ^{82}Kr and interferences signal intensity with changes of Ar shielding gas flow rate with AIRD

Intensity (cps) / Flow rate (L min^{-1})	^{82}Kr	^{12}C	^{15}N	^{16}O	^{18}OHH	$^{40}Ar^{14}N$	$^{40}Ar^{16}O$
0	1.92E+08	2.16E+06	1.20E+06	2.84E+08	5.59E+07	1.38E+05	3.24E+04
1	1.99E+08	2.19E+06	1.05E+06	2.39E+08	4.50E+07	1.15E+05	2.61E+04
2	2.02E+08	1.99E+06	8.80E+05	1.97E+08	4.40E+07	9.31E+04	2.24E+04
3	2.01E+08	1.97E+06	7.75E+05	1.69E+08	4.00E+07	8.13E+04	1.97E+04
4	2.01E+08	2.00E+06	7.32E+05	1.59E+08	3.93E+07	7.66E+04	1.89E+04
5	2.02E+08	1.98E+06	6.88E+05	1.48E+08	3.78E+07	7.08E+04	1.77E+04
6	2.01E+08	1.97E+06	6.45E+05	1.37E+08	3.61E+07	6.59E+04	1.67E+04
7	1.96E+08	2.04E+06	7.21E+05	1.57E+08	3.88E+07	7.41E+04	1.83E+04
8	1.51E+08	1.60E+06	4.96E+05	1.04E+08	2.58E+07	5.76E+04	1.87E+04
9	1.47E+08	1.69E+06	5.14E+05	1.08E+08	2.58E+07	6.02E+04	1.96E+04
10	1.45E+08	1.86E+06	5.66E+05	1.19E+08	2.46E+07	6.66E+04	2.01E+04
11	1.32E+08	2.15E+06	6.68E+05	1.45E+08	3.11E+07	7.91E+04	2.44E+04
12	1.19E+08	2.32E+06	8.72E+05	1.97E+08	3.56E+07	1.04E+05	3.04E+04
13	1.07E+08	2.47E+06	1.03E+06	2.33E+08	4.04E+07	1.22E+05	3.57E+04
14	1.03E+08	3.12E+06	1.23E+06	2.83E+08	4.62E+07	1.50E+05	4.21E+04
15	1.01E+08	3.73E+06	1.41E+06	3.26E+08	4.92E+07	1.72E+05	4.68E+04

Table S4. The ^{82}Kr and interferences signal intensity with changes of He shielding gas flow rate with AIRD

Intensity (cps) / Flow rate (L min^{-1})	^{82}Kr	^{12}C	^{15}N	^{16}O	^{18}OHH	$^{40}Ar^{14}N$	$^{40}Ar^{16}O$
0	1.91E+08	2.39E+06	1.17E+06	2.78E+08	5.47E+07	1.34E+05	3.21E+04
1	1.42E+08	1.92E+06	8.39E+05	1.90E+08	3.55E+07	1.01E+05	2.87E+04
2	1.47E+08	1.80E+06	7.86E+05	1.77E+08	3.04E+07	9.42E+04	2.58E+04
3	1.51E+08	1.64E+06	7.28E+05	1.65E+08	2.95E+07	8.77E+04	2.43E+04
4	1.49E+08	1.52E+06	6.75E+05	1.56E+08	3.21E+07	8.06E+04	2.36E+04
5	1.50E+08	1.51E+06	6.56E+05	1.51E+08	3.11E+07	7.77E+04	2.27E+04
6	1.48E+08	1.48E+06	6.58E+05	1.51E+08	3.07E+07	7.81E+04	2.29E+04
7	1.48E+08	1.43E+06	6.17E+05	1.40E+08	2.92E+07	7.28E+04	2.16E+04
8	1.51E+08	1.41E+06	5.82E+05	1.31E+08	2.76E+07	6.87E+04	2.02E+04
9	1.55E+08	1.37E+06	5.21E+05	1.13E+08	2.47E+07	6.01E+04	1.78E+04
10	1.57E+08	1.34E+06	4.73E+05	1.00E+08	2.24E+07	5.40E+04	1.61E+04
11	1.58E+08	1.34E+06	4.81E+05	1.00E+08	2.07E+07	5.43E+04	1.55E+04
12	1.56E+08	1.33E+06	4.99E+05	1.05E+08	2.04E+07	5.72E+04	1.61E+04
13	1.55E+08	1.32E+06	5.19E+05	1.11E+08	2.16E+07	6.00E+04	1.69E+04
14	1.53E+08	1.40E+06	5.49E+05	1.23E+08	2.66E+07	6.40E+04	1.89E+04
15	1.50E+08	1.39E+06	5.57E+05	1.26E+08	2.73E+07	6.50E+04	1.93E+04

Table S5. The ^{82}Kr and interferences signal intensity with changes of carrier gas flow rate with AIRD

Intensity (cps) / Flow rate (L min^{-1})	^{82}Kr	^{12}C	^{15}N	^{16}O	^{18}OHH	$^{40}Ar^{14}N$	$^{40}Ar^{16}O$
0.2	1.40E+07	1.01E+05	9.17E+04	1.79E+07	6.03E+06	6.62E+03	8.52E+03
0.3	1.54E+07	1.05E+05	8.74E+04	1.70E+07	6.01E+06	6.25E+03	7.14E+03
0.4	1.74E+07	1.19E+05	8.88E+04	1.74E+07	6.18E+06	6.51E+03	6.27E+03
0.5	4.48E+07	3.75E+05	2.48E+05	5.07E+07	1.48E+07	1.71E+04	9.08E+03
0.6	1.44E+08	9.38E+05	5.24E+05	1.10E+08	2.91E+07	4.35E+04	1.47E+04
0.7	1.97E+08	1.30E+06	6.30E+05	1.34E+08	3.15E+07	6.08E+04	1.71E+04
0.8	1.79E+08	1.29E+06	5.48E+05	1.16E+08	2.36E+07	6.10E+04	1.64E+04
0.9	1.41E+08	1.40E+06	4.73E+05	1.02E+08	2.22E+07	5.74E+04	1.51E+04
1	1.16E+08	1.64E+06	4.52E+05	9.92E+07	1.92E+07	5.70E+04	1.30E+04
1.1	9.86E+07	2.26E+06	4.69E+05	1.08E+08	1.80E+07	6.34E+04	1.11E+04
1.2	8.62E+07	3.48E+06	5.12E+05	1.22E+08	1.83E+07	7.87E+04	9.66E+03

Table S6. The ^{82}Kr and interferences signal intensity with changes of carrier gas flow rate without AIRD

Intensity (cps) / Flow rate (L min^{-1})	^{82}Kr	^{12}C	^{15}N	^{16}O	^{18}OHH	$^{40}Ar^{14}N$	$^{40}Ar^{16}O$
0.2	4.20E+06	4.98E+04	6.86E+04	1.38E+07	3.66E+06	6.71E+03	1.24E+04
0.3	4.77E+06	6.01E+04	7.78E+04	1.66E+07	4.33E+06	7.00E+03	1.17E+04
0.4	5.02E+06	7.93E+04	9.33E+04	2.08E+07	5.40E+06	7.20E+03	1.11E+04
0.5	1.21E+07	3.07E+05	3.17E+05	7.32E+07	1.81E+07	2.11E+04	1.43E+04
0.6	3.46E+07	5.79E+05	5.22E+05	1.27E+08	3.21E+07	4.33E+04	1.68E+04
0.7	7.55E+07	1.22E+06	9.40E+05	2.30E+08	5.10E+07	9.08E+04	2.49E+04
0.8	1.46E+08	2.47E+06	1.64E+06	4.09E+08	8.42E+07	1.84E+05	4.21E+04
0.9	1.26E+08	2.24E+06	1.29E+06	3.48E+08	7.55E+07	1.68E+05	3.74E+04
1	8.72E+07	2.22E+06	9.69E+05	2.76E+08	5.77E+07	1.44E+05	2.97E+04
1.1	6.52E+07	2.66E+06	8.26E+05	2.47E+08	4.61E+07	1.46E+05	2.49E+04
1.2	5.26E+07	4.16E+06	7.76E+05	2.46E+08	3.93E+07	1.80E+05	2.22E+04