

Table 1. Chemical analyses of Dalradian metavolcanic rocks (Major elements recalculated 100%, and

SAMPLE	GRIDREF	LOCATION	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃ *	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	Nb
Islay Subgroup (see text for component units)													
CAB1	NJ16481401	Muckle Fergie	50.41	2.85	13.94	15.22	0.19	5.17	9.30	2.39	0.18	0.35	18.1
CAB4	NJ17301370	Muckle Fergie	50.44	2.13	15.62	12.64	0.18	7.82	7.74	2.70	0.48	0.25	11.7
Easdale Subgroup (see text for component units)													
385	NN968627	Ben Vrackie	49.22	1.31	13.47	13.62	0.28	10.05	9.03	2.62	0.23	0.15	4.6
936	NN966632	Ben Vrackie	51.10	1.69	15.44	10.14	0.21	9.35	8.03	3.66	0.25	0.12	3.1
954		Ben Vrackie	49.61	1.53	12.53	12.87	0.19	9.55	11.22	2.00	0.33	0.17	5.3
1030	NN944627	Ben Vrackie	49.67	1.86	12.49	14.44	0.22	8.26	8.09	4.61	0.16	0.20	6.1
1040	NN947629	Ben Vrackie	45.84	1.75	10.83	14.65	0.24	8.74	17.01	0.68	0.03	0.23	5.1
1048	NN945630	Ben Vrackie	49.04	2.12	12.39	14.54	0.22	7.62	9.49	4.11	0.29	0.18	6.5
1062	NN946632	Ben Vrackie	50.83	1.81	12.80	13.04	0.20	6.81	11.67	2.56	0.11	0.18	10.6
385E	NN068628	Ben Vrackie	47.53	1.57	12.53	15.07	0.31	9.99	11.34	1.26	0.26	0.14	5.1
77-21	NN951632	Ben Vrackie	49.86	1.56	12.05	14.17	0.25	8.74	10.44	2.74	0.10	0.11	3.2
77-23	NN954635	Ben Vrackie	49.91	1.73	10.95	15.14	0.23	8.36	11.12	2.35	0.07	0.14	3.5
77-24	NN954636	Ben Vrackie	49.95	1.34	11.29	13.35	0.19	9.79	12.61	1.01	0.34	0.12	2.6
77-25	NN954636	Ben Vrackie	50.20	1.37	11.09	13.56	0.20	9.37	12.65	1.17	0.26	0.13	2.7
B10/810	NN990644	Ben Vrackie	50.06	1.74	13.06	14.19	0.21	7.81	9.41	3.05	0.25	0.22	9.7
BV127	NN959644	Ben Vrackie	49.55	1.62	12.81	13.90	0.19	9.49	9.05	2.95	0.29	0.15	5.5
BV50	NN941639	Ben Vrackie	46.91	2.02	13.02	15.14	0.19	6.14	15.05	1.12	0.09	0.32	9.3
BV56	NN945643	Ben Vrackie	46.68	2.17	10.24	15.66	0.25	9.20	13.62	1.61	0.30	0.25	6.7
BV93A	NN961637	Ben Vrackie	49.32	1.88	12.04	13.60	0.28	8.55	11.83	1.98	0.35	0.18	5.7
C6	NN941652	Ben Vrackie	48.48	1.71	12.29	13.45	0.20	7.06	15.24	1.42	0.03	0.12	3.6
CN22	NN963654	Ben Vrackie	50.66	1.71	12.03	14.18	0.20	8.01	10.69	2.11	0.25	0.17	8.6
CN53	NN971652	Ben Vrackie	51.06	1.69	10.60	14.27	0.21	10.14	8.65	3.01	0.13	0.23	7.0
L40	NN963648	Ben Vrackie	51.72	1.93	10.74	14.94	0.23	7.99	10.62	1.59	0.06	0.17	5.6
T32		Ben Vrackie	48.42	1.67	12.87	13.91	0.24	10.72	8.68	2.48	0.88	0.13	4.3
V35		Ben Vrackie	49.59	1.35	12.67	13.53	0.24	9.34	10.27	2.76	0.14	0.10	4.2
GF1	NO0249 7109	Glen Fearnate	47.68	2.36	15.83	12.11	0.17	8.59	9.37	2.84	0.58	0.48	21.3
GF2	NO02477116	Glen Fearnate	58.14	0.65	16.48	6.22	0.17	4.57	9.83	1.16	2.59	0.19	15.1
GF3	NO01697269	Glen Fearnate	47.56	2.13	13.48	15.96	0.26	8.65	8.29	3.30	0.17	0.18	6.5
GF4	NO01677269	Glen Fearnate	52.03	1.67	13.48	12.93	0.23	8.34	7.77	3.31	0.13	0.11	3.3
GF5	NO01207369	Glen Fearnate	49.26	1.90	13.78	13.78	0.25	6.95	10.72	3.07	0.12	0.17	5.4
MD3	NO32299186	Meall Dubh	51.50	1.54	13.12	11.98	0.24	8.68	9.50	3.03	0.29	0.12	3.2
EPT270	NO31329054	Meall Dubh	51.00	1.35	13.43	12.42	0.22	9.38	8.50	3.31	0.27	0.12	2.7
EPT268	NO31179069	Meall Dubh	52.46	1.54	12.48	13.20	0.24	7.91	8.28	3.28	0.48	0.12	6.2
EPT267	NO32579261	Meall Dubh	51.23	1.68	11.83	13.01	0.22	8.94	8.89	3.52	0.53	0.15	5.5
CAB2	NJ18911360	Muckle Fergie	46.65	1.55	18.51	15.25	0.18	6.43	6.58	4.46	0.15	0.25	13.0
CAB3	NJ19031362	Muckle Fergie	53.84	1.52	15.71	9.58	0.14	7.07	6.42	5.36	0.09	0.26	10.1
GNI-35	H523981	Craig	48.71	1.19	13.98	9.35	0.25	8.14	10	4	0.12	0.13	8
GNI-36	H523981	Craig	46.95	1.08	14.81	10.63	0.22	9.49	9.48	2.97	0.16	0.11	7
GNI-38	H523981	Craig	51.24	1.19	14.48	9.57	0.19	8.02	8.4	4.2	0.12	0.12	9
GNI-40	H493974	Butterlope Glen	47.34	0.57	16.21	10.97	0.18	8.48	9.17	2.2	0.37	0.04	3
GNI-45	H493974	Butterlope Glen	47.87	1.12	14.78	10.7	0.18	9.03	8.39	3.16	0.65	0.12	8
GNI-47	H493974	Butterlope Glen	52.6	0.95	14.04	9.17	0.13	8.29	7.7	4.27	0.17	0.09	8
GNI-65	C671048	Cuscapel Bridge	48.69	1.15	14.39	11.09	0.17	7.25	11.64	2.2	0.41	0.12	8
UY242	H357968	Strabane	55.79	1.3	14.71	11.74	0.15	7.72	5.46	2.46	0.45	0.13	10
UY243	H354970	Strabane	50.9	0.96	13.19	10.51	0.15	11.37	11.45	1.4	0.05	0.08	4
UY244	H354970	Strabane	46.93	1.38	12.6	13.19	0.19	14.15	9.87	1.92	0.05	0.13	9
BAL1	NO35889130	Ballater	49.61	1.56	15.62	10.78	0.16	10.92	7.57	3.07	0.48	0.21	13.6
BAL2	NO35619304	Ballater	47.71	2.53	16.26	11.08	0.17	8.36	9.38	3.36	0.59	0.56	31.9

BAL4	NO36769388	Ballater	49.53	1.04	19.01	7.75	0.14	8.40	9.71	3.46	0.81	0.15	10.3
BAL5	NO36869400	Ballater	47.68	1.03	16.06	10.92	0.19	10.35	10.03	2.87	0.66	0.20	9.4

Blackwater Formation

L21	NJ35833024	Cabrach	40.6	4.23	13	15.18	0.19	12.93	12.35	0.02	0.84	0.92	53.0
WXR854	NJ41603521	Cabrach	41.67	1.86	5.98	14.84	0.17	11.22	19.67	0.79	0.11	0.34	14.0
L22	NJ35963040	Cabrach	46.1	4.46	14.6	15.25	0.2	6.64	10.04	2.39	0.31	0.43	19.0
WXR855	NJ41133507	Cabrach	48.06	3.22	10.45	15.48	0.13	7.75	8.61	1.93	2.74	0.63	26.0
ZN1769	NJ34122830	Cabrach	48.2	2.91	14.79	13.31	0.2	6.47	9.93	2.66	0.49	0.83	43.0
L16	NJ37773179	Cabrach	40.9	1.12	4.23	16.65	0.19	34.86	2.01	0.02	0	0.15	5.0
L7	NJ36463086	Cabrach	42.3	1.83	5.72	15.28	0.17	28.88	5.58	0.02	0	0.21	11.0
L11	NJ37053153	Cabrach	42.31	2.57	8.99	15.37	0.18	23.27	5.09	0.05	0.01	0.33	12.0
L10	NJ37023142	Cabrach	44.5	1.77	6.71	15.59	0.2	20.63	9.23	0.03	0.01	0.27	12.0
L5	NJ36243032	Cabrach	45.69	2.84	10.39	14.36	0.28	12.92	13.08	0.15	0.28	0.34	11.0
L12	NJ37423171	Cabrach	49.6	2.93	11.25	12.79	0.14	11.95	9.18	1.47	0.04	0.44	14.0
L6	NJ36273034	Cabrach	48.2	2.69	12.58	10.76	0.15	6.08	10.48	2.67	0.26	0.3	18.0
L17	NJ37503080	Cabrach	41.82	4.63	15.35	16.87	0.23	7.11	8.94	1.12	2.95	1.04	72.0
WXR702	NJ39323210	Cabrach	44.22	2.5	9.39	15.3	0.17	8.22	12.11	2.31	0.25	0.79	49.0
WXR760	NJ42313491	Cabrach	48.21	1.73	12.87	12.81	0.2	7.75	10.19	1.99	0.94	0.27	8.0
L13	NJ37843139	Cabrach	40.1	4.74	13.11	15.89	0.21	7.06	15.66	0.97	0.92	1.09	64.0
WXR710	NJ40393316	Cabrach	47.31	2.28	11.34	16.12	0.16	6.88	7.89	3.87	0.16	0.35	19
ZNR1788	NJ37343086	Cabrach	48.2	2.91	14.89	13.32	0.18	6.72	9.95	2.7	0.49	0.84	67.0
L3	NJ37303087	Cabrach	43.9	3.6	18.98	13.19	0.2	6.03	7.66	0.09	4.15	1.92	92.0

Tayvallich (Awe)

GJB214		E of Loch Awe	52.50	1.48	11.31	9.71	0.17	12.57	8.81	2.87	0.35	0.23	11.8
GJB270		E of Loch Awe	53.59	1.71	10.55	11.64	0.17	9.66	9.35	2.91	0.18	0.24	8.9
GJB287		E of Loch Awe	53.36	1.64	12.58	10.35	0.13	6.18	13.21	1.77	0.54	0.22	12.8
GJB297		E of Loch Awe	44.95	1.44	10.94	17.42	0.21	17.29	6.96	0.32	0.23	0.25	11.4
GJB131		Loch Avich area	49.65	2.10	12.82	13.60	0.19	11.28	7.26	1.73	0.96	0.41	22.0
GJB201		Loch Awe	50.14	3.06	11.98	18.30	0.17	8.60	6.00	0.22	1.00	0.52	17.7
GJB204		Loch Awe	52.57	2.44	12.00	15.11	0.18	6.62	8.21	1.71	0.59	0.57	19.2
GJB213		N Loch Awe	59.48	1.08	13.23	7.95	0.11	7.41	5.10	4.63	0.80	0.20	19.0
GJB259		N Loch Awe	56.13	1.24	12.77	9.28	0.14	10.52	5.79	2.65	1.26	0.21	16.6
GJB260		N Loch Awe	50.89	1.00	11.98	12.21	0.16	16.55	4.23	2.62	0.24	0.12	6.5
GJB261		N Loch Awe	47.10	1.05	9.58	11.55	0.17	15.58	12.72	1.59	0.56	0.11	6.0
GJB367		N Loch Awe	57.43	1.33	11.58	8.14	0.14	10.45	6.34	3.49	0.92	0.19	14.8
GJB368		N Loch Awe	57.82	1.23	11.23	7.56	0.13	9.75	7.16	4.20	0.74	0.17	13.0
GJB369		N Loch Awe	56.22	1.62	12.86	9.96	0.14	10.48	5.65	1.71	1.10	0.26	19.7
GJB370		N Loch Awe	58.71	1.27	11.78	9.23	0.14	8.79	6.13	2.77	0.94	0.24	16.5
GJB37872		N Loch Awe	55.12	1.22	9.15	8.20	0.12	11.30	9.59	3.23	1.90	0.17	7.4
GJB75		N Loch Awe	53.97	1.31	16.93	9.70	0.13	7.38	4.88	3.70	1.85	0.15	12.7

Tayvallich (Carsaig)

CAR12		Carsaig, Tayvallich	48.84	3.74	11.50	18.09	0.25	6.57	7.03	2.05	0.30	1.65	63.8
CAR16B		Carsaig, Tayvallich	47.95	3.29	10.32	17.79	0.27	6.02	9.45	2.66	0.61	1.64	61.6
CAR17		Carsaig, Tayvallich	47.42	3.83	10.33	17.30	0.28	6.11	9.82	2.55	0.76	1.59	56.7
CAR19		Carsaig, Tayvallich	46.07	3.82	10.48	18.57	0.29	6.71	9.28	2.40	0.66	1.72	57.5
CAR7		Carsaig, Tayvallich	46.82	3.68	13.06	16.78	0.19	6.34	9.56	0.65	1.37	1.55	62.8
CAR9		Carsaig, Tayvallich	48.94	3.71	11.53	18.14	0.21	6.18	8.22	1.39	0.10	1.57	56.8
69-219	NR772946	Crinan	49.54	2.28	12.10	15.93	0.19	9.04	6.99	2.71	0.82	0.39	33.5
69-204	NR80 92	Crinan Canal	42.95	4.07	8.74	21.25	0.27	9.67	11.08	1.44	0.23	0.30	26.9
69-291		Crinan Canal	43.88	4.63	9.31	20.27	0.27	8.48	10.75	1.93	0.19	0.29	33.1
70-68	NR805913	Crinan Canal	44.18	6.04	10.41	18.29	0.26	9.11	9.27	1.85	0.41	0.18	18.7
69-140	NR724876	Tayvallich Pen.	50.82	2.93	11.20	14.79	0.20	6.23	8.04	3.54	0.57	1.66	55.5
70-122	NR715840	Tayvallich Pen	51.83	2.52	13.73	14.29	0.14	6.11	4.07	3.59	2.70	1.02	87.8

EPT247	NR693817	Tayvallich Pen.	50.71	2.90	13.57	14.04	0.21	7.12	6.05	3.43	0.81	1.16	78.9
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Loch Avich Lavas Formation

GJB356		Loch Avich	59.37	0.97	11.61	6.21	0.10	7.69	9.82	4.09	0.03	0.11	12.4
GJB357		Loch Avich	51.62	0.99	15.02	7.73	0.11	6.74	15.72	1.60	0.35	0.11	12.4
GJB358		Loch Avich	59.63	1.05	13.35	6.61	0.09	8.51	6.57	4.03	0.02	0.15	13.0
GJB359		Loch Avich	60.09	0.98	13.46	6.64	0.15	9.45	5.30	3.77	0.02	0.13	14.0
GJB360		Loch Avich	61.03	0.98	13.73	7.38	0.12	9.79	3.48	3.29	0.02	0.16	14.1
GJB362		Loch Avich	53.46	1.14	13.61	8.07	0.12	12.09	7.99	3.11	0.27	0.15	14.0
GJB363		Loch Avich	55.23	1.22	14.66	7.65	0.13	12.59	4.59	3.54	0.23	0.16	14.9
GJB364		Loch Avich	56.67	1.01	15.50	6.55	0.11	9.20	5.67	4.92	0.25	0.13	12.8
EPT216	NM954 160	Loch Avich	51.90	1.17	17.57	8.00	0.11	5.29	12.95	2.71	0.14	0.13	14.5
EPT217	NM954 160	Loch Avich	56.07	1.14	16.42	7.33	0.12	7.26	6.46	4.91	0.16	0.13	14.2
EPT219	NM954 160	Loch Avich	55.57	1.06	14.61	7.01	0.10	8.55	8.69	3.37	0.91	0.13	12.6
EPT220	NM954 160	Loch Avich	59.56	1.05	14.65	4.66	0.08	7.40	5.54	5.78	1.16	0.12	12.8
EPT221	NM954 160	Loch Avich	56.89	1.15	13.63	7.72	0.11	10.05	5.96	3.39	0.98	0.13	13.9

hydrous)

Zr	Y	Sr	Ba	Rb	Zn	Cu	Ni	Cr	V	Sc	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb
194.5	38.5	223.9	15.5	2.0	118.4	21.1	33.0	55.6	371.6	43.9	14.4	34.5	4.8	26.9	5.98	1.48	5.03	0.98
135.6	27.4	126.5	26.2	15.0	113.4	34.0	69.4	265.1	290.8	40.0	10.3	24.4	3.3	16.9	5.30	1.68	3.86	0.71
96.0	34.4	220.1	47.4	5.3	209.6	37.8	108.6	240.9	312.2	48.7								
95.7	29.8	87.0	24.4	5.1	113.8	11.3	20.9	348.1	375.6	66.7								
105.4	35.5	498.5	18.3	7.1	115.7	63.4	132.0	269.3	324.4	46.9	5.5	15.9	2.55	13.0	4.25	1.48	5.42	0.97
117.2	42.3	268.3	41.1	3.0	108.9	14.4	97.3	253.0	380.5	63.6								
100.3	37.2	1016.7	7.7	0.9	109.8	12.4	77.3	270.9	386.2	47.2	5.1	14.5	2.31	11.6	3.81	1.28	5.03	0.91
121.7	44.2	416.1	40.5	7.6	121.1	52.2	69.1	86.5	439.2	67.1								
121.3	35.1	395.1	38.1	2.2	129.5	32.3	64.6	150.5	344.5	49.2								
106.5	40.3	240.8	11.6	6.3	190.3	14.7	96.6	256.3	359.7	60.2								
84.4	34.4	151.3	124.4	2.0	116.8	9.8	54.8	109.4	361.1	69.6								
95.7	38.2	191.3	28.1	1.3	112.9	15.0	50.4	203.0	390.6	67.6								
74.7	30.5	193.2	236.1	14.9	100.9	47.1	62.7	248.7	364.3	57.1								
74.7	30.4	263.3	147.4	4.5	100.0	10.3	69.5	256.8	363.9	63.0								
154.7	47.3	283.5	11.8	2.7	123.9	44.2	85.3	287.2	362.1	57.0								
107.1	37.6	137.8	60.0	6.9	164.5	8.9	105.0	287.3	340.6	59.0								
116.4	45.4	1736.4	17.8	0.9	88.5	67.9	53.4	50.6	559.4	56.3								
125.5	47.7	189.7	44.8	9.3	116.9	11.7	90.9	157.5	448.5	54.7								
116.2	51.5	247.1	11.9	8.5	146.2	24.7	66.0	152.6	395.7	62.4								
88.4	35.0	792.3	0.7	1.1	73.5	213.8	61.0	134.9	415.9	61.9								
102.3	34.5	137.0	1.8	2.8	86.7	60.1	56.4	113.6	360.4	59.9								
155.3	48.6	208.6	12.8	4.1	127.4	27.2	105.6	137.0	330.6	56.2								
122.6	43.9	765.0	6.0	1.9	136.0	80.3	65.4	118.6	405.6	59.5								
99.4	31.6	205.2	790.3	17.1	210.5	38.5	97.0	273.8	385.7	60.2								
78.9	33.0	181.0	63.7	1.3	168.0	52.7	90.1	225.2	349.7	68.1								
189.3	32.0	376.6	259	13.5			185	312	192	25	19.3	42.8	5.7	26.5	7.96	1.81	5.59	0.85
120.4	31.9	607.5	817	89.2			49	75	71	9	47.6	92.0	10.8	41.5	8.08	1.40	6.24	0.91
187.6	60.6	80.9	58	1.5			42	65	366	59	7.5	21.7	3.3	17.6	6.23	1.38	6.19	1.22
105.3	36.5	109.0	68	2.1			55	137	382	61	3.4	9.6	1.7	8.4	4.00	0.92	3.37	0.76
129.9	42.8	162.5	87	1.1			69	214	408	58	5.1	15.4	2.6	14.8	4.51	1.25	4.88	0.78
97.2	30.9	129.1	61	4.7			113	306	258	56	3.7	9.3	1.8	9.8	3.11	1.00	3.23	0.66
77.3	29.3	159.9	21.8	5.7	114.1	40.7	49.6	297.3	312.8	63.9								
121.1	33.5	147.6	83.1	11.4	145.9	21.1	32.5	213.3	274.9	56.8								
108.1	35.4	113.7	92.3	15.6	117.1	55.2	53.4	234.6	346.8	68.7								
132.7	28.3	135.0	73.5	1.2	123.6	49.2	200.8	354.5	216.1	32.3	11.6	24.9	3.3	16.7	4.51	1.05	3.65	0.65
137.4	19.6	314.6	30.4	0.8	87.9	16.7	178.0	440.9	152.0	27.7	3.7	7.2	1.3	6.8	2.37	0.66	2.16	0.48
69	23	270	45	1	67	79	161	418	253	35	5.8	13.3	1.8	10.1	2.78	0.93	3.11	0.64
63	24	258	26	1	100	15	165	449	233	33								
71	23	269	55		151	47	151	460	284	41	6.0	14.7	2.0	10.3	3.12	1.12	3.39	0.65
25	19	195	60	8	72	112	131	282	174	29								
66	22	243	298	14	79	46	179	388	223	36								
56	15	125	80	2	70	71	132	547	189	34	6.9	11.4	1.5	7.7	2.39	0.68	2.48	0.45
68	20	186	49	22	84	93	58	146	291	44	5.9	12.7	1.9	9.5	2.87	0.96	2.81	0.54
155	28	282	105	12	107	105	85	175	250									
56	28	514	19	0	70	62	197	535	200									
88	24	192	19	1	106	8	205	448	203									
97.4	22.1	230.1	125	22.3			307	476	178	33	8.2	17.1	2.4	11.6	3.59	0.87	3.13	0.64
201.0	38.8	483.9	163	14.4			209	331	194	34	17.3	40.2	5.2	26.7	6.87	1.48	5.23	1.00

63.0	17.6	364.4	329	35.2			141	259	161	32	7.6	15.9	2.1	11.3	2.45	0.69	1.94	0.43
48.8	19.1	366.3	114	23.2			236	449	196	38	6.1	14.4	2.0	10.4	2.96	0.84	2.07	0.46

217.0	26.0	57.0	79	19.0			64.0	160.0			51.4	106	12.0	54.5	11.2	3.83	10.1	
155.0		242.0	19.0	3.0			978.0	#####	194.0									
155.0	21.0	336.0	256.0	14.0			40.0	59.0										
245.0		324.0	135.0	28.0			176.0	239.0	211.0									
192.0		544.0	228.0	15.0			63.0	107.0										
56.0	8.0	37.0	9	10.0				1327			5.7	13.6	1.87	9.74	2.59	0.69	2.45	
89.0	13.0	187.0	21.0	11.0	78.0		892.0	#####										
140.0	16.0	60.0	28	9.0			689.0	947.0			18.4	39.2	5.74	27.9	6.33	1.63	5.78	
95.0	11.0	88.0	16.0	10.0	87.0		#####	#####										
128.0	16.0	372.0	85	15.0			267.0	636.0			18.3	42.4	5.62	27.3	6.34	1.95	6.00	
150.0	20.0	313.0	55.0	11.0	84.0		185.0	619.0										
133.0	19.0	361.0	11	11.0			44.0	99.0			18.1	39.9	5.01	24.3	5.87	2.06	5.66	
296.0	46.0	492.0	658	65.0			65.0	20.0			73.1	140	16.7	77	15.8	5.26	14.4	
221.0		526.0	247.0	2.0	138.0	38.0	183.0	387.0	235.0									
122.0		342.0	137.0	15.0	80.0	51.0	41.0	343.0	231.0									
268.0	30.0	540.0	#####	20.0	112.0		46.0	24.0										
116		217	79	5	138	82	19	263	218									
284.0	27	756.0	548.0	25.0			42.0	67.0										
424.0	39	427.0	828.0	64.0			13.0	6.0										

109.7	17.6	355.3	262.7	6.3	109.2	33.2	213.2	393.6	119.9	21.0								
123.5	23.9	212.5	33.1	2.6	110.4	50.2	146.2	170.6	178.9	22.5								
110.6	13.9	1483.2	146.5	9.4	65.6	129.9	148.0	324.2	179.5	21.2								
133.5	24.5	129.6	123.9	4.0	153.1	37.1	523.3	508.1	199.1	17.5								
163.0	25.7	337.2	500.2	15.4	130.7	35.4	164.2	210.8	217.4	23.9								
218.8	27.5	321.7	278.0	22.8	213.3	12.3	49.0	66.1	323.6	39.2								
220.8	35.7	366.3	176.3	17.2	145.1	61.0	39.3	118.7	297.4	33.1								
260.9	27.2	228.3	221.0	15.2	95.8	50.3	97.9	224.3	116.6	18.6								
214.4	26.0	175.1	447.3	23.8	105.6	19.0	145.8	303.6	123.2	18.9								
68.8	9.9	43.4	33.7	3.3	104.1	55.6	536.0	728.3	133.3	16.6								
64.8	11.0	197.4	142.3	10.8	99.8	34.8	777.1	891.7	137.5	15.0								
182.6	18.9	106.9	384.0	14.7	100.0	30.4	195.7	341.5	96.9	23.7								
163.2	20.9	107.3	320.6	14.8	81.6	88.2	158.6	273.4	100.3	22.5								
261.8	27.8	237.0	373.6	21.2	161.1	34.6	162.2	239.8	131.2	18.3								
213.0	24.9	209.3	348.8	17.9	89.3	34.2	117.0	299.8	121.1	16.0								
76.4	14.6	193.1	380.0	34.4	64.7	99.1	215.3	615.2	139.6	17.5								
128.8	19.7	233.4	418.2	27.0	90.8	30.5	65.9	246.2	157.5	19.3								

323.5	46.7	281.2	654.0	1.4	165.4	58.2	11.4	9.7	198.9	28.2								
293.5	56.9	346.1	417.6	3.8	162.7	22.7	11.7	8.7	177.2	25.2								
264.0	52.5	338.4	574.7	5.0	162.3	35.2	12.6	8.1	191.3	34.1								
269.0	54.6	343.1	294.1	4.8	179.1	17.8	12.1	7.9	196.2	29.7								
318.3	52.2	231.8	518.7	30.0	144.0	50.6	9.6	6.7	189.0	34.8								
281.9	50.1	183.1	10.8	2.1	165.9	92.0	11.5	5.2	196.6	36.4								
149.5	25.6	519.0	350.4	30.6	127.1	29.0	104.9	194.7	245.4	32.6								
128.3	19.2	401.6	60.4	5.5	172.2	134.5	69.0	35.9	705.2	74.8								
159.4	23.7	434.3	131.4	4.2	170.6	50.6	48.0	23.7	579.2	61.2								
108.9	16.4	497.2	81.5	14.8	125.1	33.3	78.1	67.2	599.3	76.3								
283.1	57.8	478.1	158.2	10.4	125.9	14.3	7.9	5.8	196.9	34.8								
444.3	65.2	287.8	392.5	47.4	190.4	14.9	40.3	14.7	120.5	18.1								

396.9 56.0 351.7 189.2 10.7 166.3 9.4 17.5 15.0 140.4 27.7

187.6 28.5 958.0 10.0 0.7 59.0 20.4 77.9 250.2 112.3 18.1

184.4 31.9 1508.5 125.1 6.2 62.1 55.0 77.6 249.7 170.6 16.5

200.0 27.7 761.5 5.2 0.1 63.9 20.7 79.9 258.5 111.5 19.1

216.2 30.4 158.1 6.1 0.0 92.8 40.4 70.9 253.2 119.7 20.0

215.2 31.5 427.1 15.8 0.4 89.4 55.6 85.8 260.4 106.8 14.6

209.1 29.0 782.0 155.1 5.4 88.3 10.2 96.7 298.2 120.0 20.8

222.3 35.1 374.6 119.3 3.8 106.8 28.4 102.3 331.5 101.6 23.1

189.1 31.7 482.3 124.9 3.8 80.1 27.8 74.3 273.1 111.7 21.4

217.2 36.6 1573.5 59.3 2.2 61.0 41.5 65.3 299.4 161.4 19.9 27.7 58.9 7.45 30.2 6.80 1.96 6.70 1.06

211.0 31.0 349.2 53.8 2.8 93.6 27.3 69.7 295.2 122.2 19.0 26.3 58.9 7.51 30.1 6.80 1.43 6.60 1.05

192.0 31.7 690.8 389.2 16.1 71.8 26.0 76.5 267.6 129.3 15.9

197.3 22.9 248.8 509.9 20.6 67.7 38.3 50.1 282.9 99.8 22.4

210.3 29.4 373.9 459.3 19.1 98.9 36.1 58.9 299.1 112.4 21.7 25.6 56.6 7.11 28.6 6.46 1.46 6.05 0.97

Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	Th	MgO	Ni	[La/Yb] _N
5.53	1.12	3.28	0.38	2.88	0.44	1.30	4.20	1.65	5.17	33.0	3.58649789
5.14	1.04	2.38	0.42	2.12	0.34	0.87	2.98	1.13	7.82	69.4	3.484993233
									10.05	108.6	
									9.35	20.9	
6.35	1.39	3.92	0.58	3.67	0.57	2.6	0.47	0.37	9.55	132.0	1.07497212
									8.26	97.3	
6.02	1.34	3.94	0.57	3.72	0.56	2.8	0.95	0.45	8.74	77.3	0.983394583
									7.62	69.1	
									6.81	64.6	
									9.99	96.6	
									8.74	54.8	
									8.36	50.4	
									9.79	62.7	
									9.37	69.5	
									7.81	85.3	
									9.49	105.0	
									6.14	53.4	
									9.20	90.9	
									8.55	66.0	
									7.06	61.0	
									8.01	56.4	
									10.14	105.6	
									7.99	65.4	
									10.72	97.0	
									9.34	90.1	
6.00	1.07	2.89	0.41	2.33	0.35	4.24	1.69	1.80	8.59	185	5.941580196
4.81	1.08	3.01	0.51	2.64	0.42	3.65	1.83	15.17	4.57	49	12.93312876
7.47	1.87	5.03	0.71	5.05	0.74	4.35	0.76	1.05	8.65	42	1.065296403
4.86	1.15	3.06	0.50	3.16	0.50	0.54	2.28	0.47	8.34	55	0.771778027
6.03	1.36	3.10	0.52	3.23	0.55	0.75	2.79	0.66	6.95	69	1.132578281
4.44	0.83	2.95	0.41	2.75	0.40	0.51	2.33	0.56	8.68	113	0.965093978
									9.38	49.6	
									7.91	32.5	
									8.94	53.4	
4.45	0.89	2.53	0.33	2.47	0.39	0.81	2.81	1.66	6.43	200.8	3.368694375
2.96	0.65	1.84	0.25	1.53	0.22	0.58	2.83	1.58	7.07	178.0	1.734646038
3.80	0.79	2.19	0.33	2.36	0.27	1.46	0.55	0.97	8.14	161	1.762854895
									9.49	165	
3.81	0.76	2.29	0.31	2.32	0.29	1.47	0.53	0.96	8.02	151	1.855085116
									8.48	131	
									9.03	179	
2.74	0.51	1.35	0.22	1.51	0.18	1.18	0.41	0.92	8.29	132	3.277726549
3.34	0.69	1.91	0.30	2.05	0.29	1.50	0.42	0.69	7.25	58	2.064423176
									7.72	85	
									11.37	197	
									14.15	205	
3.54	0.71	1.82	0.19	1.65	0.31	1.41	2.49	0.65	10.92	307	3.564761539
5.25	1.10	3.10	0.44	2.72	0.47	2.06	4.75	1.60	8.36	209	4.562236287

2.87	0.52	1.66	0.29	1.39	0.25	0.86	1.94	0.97	8.40	141	3.921925751
3.00	0.61	1.73	0.27	1.7	0.24	0.90	1.27	0.54	10.35	236	2.573839662
7.19	1.37	3.25		2.19	0.34				12.93	64.0	16.83525037
									11.22	978.0	
									6.64	40.0	
									7.75	176.0	
									6.47	63.0	
1.88	0.37	1.07		0.68	0.13				34.86		6.012658228
									28.88	892.0	
4.25	0.74	2.00		1.39	0.23				23.27	689.0	9.495188659
									20.63	#####	
4.43	0.81	2.03		1.46	0.23				12.92	267.0	8.99080978
									11.95	185.0	
4.26	0.86	2.14		1.49	0.25				6.08	44.0	8.713504942
10.6	2.02	5.26		4.14	0.65				7.11	65.0	12.66536212
									8.22	183.0	
									7.75	41.0	
									7.06	46.0	
									6.88	19	
									6.72	42.0	
									6.03	13.0	
									12.57	213.2	
									9.66	146.2	
									6.18	148.0	
									17.29	523.3	
									11.28	164.2	
									8.60	49.0	
									6.62	39.3	
									7.41	97.9	
									10.52	145.8	
									16.55	536.0	
									15.58	777.1	
									10.45	195.7	
									9.75	158.6	
									10.48	162.2	
									8.79	117.0	
									11.30	215.3	
									7.38	65.9	
									6.57	11.4	
									6.02	11.7	
									6.11	12.6	
									6.71	12.1	
									6.34	9.6	
									6.18	11.5	
									9.04	104.9	
									9.67	69.0	
									8.48	48.0	
									9.11	78.1	
									6.23	7.9	
									6.11	40.3	

6.34	1.25	3.33	0.44	2.69	0.38	5.4	0.96	6.55
6.15	1.18	3.11	0.42	2.44	0.34	4.5	0.99	6.54
5.7	1.11	2.98	0.39	2.35	0.33	4.4	0.95	6.40

7.12 17.5

7.69 77.9

6.74 77.6

8.51 79.9

9.45 70.9

9.79 85.8

12.09 96.7

12.59 102.3

9.20 74.3

5.29 65.3

7.386319075

7.26 69.7

7.731548731

8.55 76.5

7.40 50.1

10.05 58.9

7.813986893