

Table S1. LA-ICP-MS analysis in ppmw of the studied emerald samples from Panjsher, Afghanistan.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis* (wt%)	H ₂ O (wt%)
RS-6632 SP1	160	1.91	2.40	1540	483	1700	2130	1.7	1650	BQL**	BQL	BQL	14.3	97	42.4	1.25	0.80	1.60	2.54
RS-6632 SP2	162	1.91	2.40	1510	474	1680	2160	1.77	1710	BQL	BQL	BQL	13.9	97.5	41.6	1.29	0.80	1.60	2.54
RS-6632 SP3	162	1.89	2.45	1520	454	1710	2170	1.93	1700	BQL	BQL	BQL	14.9	96.4	41	1.27	0.77	1.58	2.53
RS-6634 SP1	85.2	1.46	1.74	949	2120	3040	3640	1.92	2290	BQL	BQL	BQL	28.4	72.1	70.7	1.20	0.84	1.20	2.39
RS-6634 SP2	86.1	1.46	1.76	968	2180	3130	3680	2.87	2280	BQL	BQL	BQL	27.8	70.3	72	1.18	0.83	1.20	2.39
RS-6634 SP3	84.9	1.48	1.82	1070	2390	3100	3580	3.09	2530	BQL	BQL	BQL	28.7	80.6	75.9	1.15	0.81	1.23	2.40
RS-6635 SP1	92.1	0.63	0.71	107	200	557	506	BQL	783	BQL	BQL	BQL	13.9	11	23.1	0.91	0.89	0.49	1.93
RS-6635 SP2	100	0.63	0.71	127	206	562	500	BQL	781	BQL	BQL	BQL	15.3	11.9	22.3	0.89	0.89	0.50	1.94
RS-6635 SP3	103	0.66	0.75	126	204	614	543	BQL	848	BQL	BQL	BQL	14.3	12.5	23.5	0.88	0.87	0.51	1.96
RS-6636 SP1	95.1	0.67	0.77	118	215	624	517	BQL	850	BQL	BQL	BQL	13.9	12	22.1	0.83	0.86	0.52	1.97
RS-6636 SP2	106	0.70	0.80	135	217	583	508	BQL	845	BQL	BQL	BQL	14.9	12.3	22.2	0.87	0.87	0.55	1.99
RS-6636 SP3	98	0.70	0.77	146	213	589	551	BQL	856	BQL	BQL	BQL	14.6	12.8	23.5	0.94	0.91	0.55	1.99
RS-6637 SP1	143	1.79	2.21	1260	289	1450	2450	1.53	1500	BQL	BQL	BQL	13.6	79.3	45.5	1.69	0.81	1.48	2.50
RS-6637 SP2	151	1.85	2.32	1300	298	1490	2490	BQL	1520	BQL	BQL	BQL	14.3	83.1	46.9	1.67	0.80	1.53	2.52
RS-6637 SP3	153	1.87	2.34	1340	293	1500	2510	1.74	1560	BQL	BQL	BQL	14.4	84.9	48.3	1.67	0.80	1.55	2.53
RS-6638 SP1	87.2	1.14	1.24	546	1940	1690	3840	BQL	2120	BQL	BQL	BQL	28.7	43.7	42.2	2.27	0.92	0.91	2.26
RS-6638 SP2	90	1.12	1.26	546	1960	1650	3830	1.38	2110	BQL	BQL	BQL	26.6	43.1	42.6	2.32	0.89	0.91	2.25

RS-6638 SP3	89.2	1.09	1.23	538	1950	1660	3830	1.7	2080	BQL	BQL	BQL	27.4	44.7	42.8	2.31	0.89	0.88	2.24
RS-6639 SP1	117	1.54	1.77	923	247	1100	2900	BQL	1270	BQL	BQL	BQL	14.6	59.7	47.2	2.64	0.87	1.25	2.42
RS-6639 SP2	119	1.54	1.77	925	243	1120	2930	BQL	1280	BQL	BQL	BQL	14.8	57.7	46.1	2.62	0.87	1.25	2.42
RS-6639 SP3	120	1.58	1.77	947	242	1100	2890	1.49	1260	BQL	BQL	BQL	15.2	60.4	46.4	2.63	0.89	1.29	2.43
RS-6640 SP1	136	1.50	1.76	734	172	816	982	BQL	1170	BQL	BQL	BQL	10.9	48.6	37.9	1.20	0.85	1.21	2.40
RS-6640 SP2	131	1.44	1.69	710	162	800	959	BQL	1130	BQL	BQL	BQL	10.9	46.4	38.2	1.20	0.85	1.16	2.38
RS-6640 SP3	130	1.37	1.63	668	148	723	944	BQL	1070	BQL	BQL	BQL	10.1	42.6	36.3	1.31	0.85	1.11	2.36
RS-6641 SP1	108	0.81	0.93	172	256	812	927	BQL	822	BQL	BQL	BQL	15.8	13.5	28.5	1.14	0.87	0.63	2.07
RS-6641 SP2	110	0.80	0.94	175	259	823	939	BQL	829	BQL	BQL	BQL	15.6	13.4	26.8	1.14	0.85	0.63	2.07
RS-6641 SP3	108	0.80	0.94	168	250	814	939	BQL	813	BQL	BQL	BQL	15.8	12.8	27	1.15	0.85	0.63	2.07

*Alkalis: ${}^7\text{Li}+{}^{23}\text{Na}+{}^{39}\text{K}+{}^{85}\text{Rb}+{}^{133}\text{Cs}$

**BQL: Below Quantification Limits.

Table S2. LA-ICP-MS analysis in ppmw of the studied emerald samples from Itabira, Brazil.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis* (wt%)	H ₂ O (wt%)
XR-8282 SP1	57.1	1.54	1.66	183	25.5	89.1	1510	10	6920	2.11	BQL**	59.7	8.97	31.7	86.6	16.95	0.93	1.18	2.42
XR-8282 SP2	51.1	1.46	1.59	172	21.2	82.1	1230	10.3	6510	2	BQL	60.7	9.24	30.8	89.3	14.98	0.92	1.11	2.39
XR-8282 SP3	52.8	1.48	1.66	182	22.6	86.4	1260	10.8	6610	2.23	BQL	57.8	8.8	31.2	95.1	14.58	0.89	1.14	2.40
XR-8283 SP1	47.3	1.69	2.06	227	114	111	2660	14.6	7090	2.55	BQL	57.3	7.12	39.4	124	23.96	0.82	1.29	2.47
XR-8283 SP2	48	1.70	2.04	213	113	111	2680	14.5	7450	2.52	BQL	61.6	6.68	39.4	128	24.14	0.83	1.30	2.47
XR-8283 SP3	46.7	1.67	2.04	204	112	108	2750	14.8	7510	2.07	BQL	67.5	7.11	38.4	120	25.46	0.82	1.28	2.46
XR-8284 SP1	61.3	1.39	1.54	265	50.4	128	3940	13.5	7250	2.81	BQL	62.2	12.4	30.1	88.7	30.78	0.90	1.07	2.36
XR-8284 SP2	58.3	1.36	1.50	246	49.6	132	3770	12.5	7100	2.79	BQL	59.1	12.3	28.5	86.1	28.56	0.91	1.05	2.35
XR-8284 SP3	58.8	1.39	1.62	222	47.8	128	3680	12.1	6930	2.36	BQL	62.3	11.9	28.6	82.8	28.75	0.86	1.07	2.36
XR-8289 SP1	57.6	1.44	1.53	228	55.1	153	3300	13.9	8250	2.93	BQL	70.8	13	29.9	82.5	21.57	0.94	1.11	2.38
XR-8289 SP2	60.1	1.42	1.63	201	58.4	153	3220	10.4	7480	2.77	BQL	53.4	12.9	31.2	80.6	21.05	0.87	1.09	2.37
XR-8289 SP3	54.4	1.42	1.55	167	58.1	153	3140	10.6	7980	2.86	BQL	50.4	12.5	26.4	77.7	20.52	0.91	1.08	2.37
XR-8291 SP1	59.7	1.48	1.67	261	38.9	149	2970	19.9	7840	2.67	BQL	58.1	12.6	38.3	93.6	19.93	0.89	1.15	2.40
XR-8291 SP2	61.4	1.46	1.66	290	37.4	136	2960	21.1	7370	2.83	BQL	63.3	11.7	36.5	91.5	21.76	0.88	1.13	2.39
XR-8291 SP3	62.4	1.44	1.59	305	37.5	141	2970	21.2	7370	2.4	BQL	59.5	11.4	35.9	94.3	21.06	0.91	1.12	2.38
XR-8342 SP1	50.9	1.22	1.37	172	41.1	116	2630	4.49	4730	2.19	BQL	39.5	13.7	20.6	73.8	22.67	0.89	0.94	2.29
XR-8342 SP2	51.1	1.24	1.34	192	36.7	107	2930	5.01	4660	2.11	BQL	42.9	12.1	20.8	72.9	27.38	0.92	0.95	2.30
XR-8342 SP3	55	1.20	1.36	176	36.1	105	2650	5.67	4950	2.54	BQL	41.8	12.4	19.1	71.7	25.24	0.88	0.92	2.28

XR-8343 SP1	66.1	1.14	1.37	240	48.8	121	3110	17.8	6030	2.46	BQL	51	11.7	30.7	70.7	25.70	0.84	0.89	2.26
XR-8343 SP2	62.3	1.19	1.36	238	48.6	123	3260	11.9	6210	2.61	BQL	56.1	12.1	31.3	70.9	26.50	0.87	0.92	2.28
XR-8343 SP3	70.8	1.37	1.63	290	81.6	152	3330	12.7	7250	2.96	BQL	53.6	12.6	37.5	82.4	21.91	0.84	1.07	2.36
XR-8344 SP1	51.8	0.97	1.15	152	40.9	52.5	1840	6.88	5040	1.99	BQL	71.3	8.86	25.1	39.9	35.05	0.85	0.75	2.17
XR-8344 SP2	47.8	1.02	1.14	167	51.1	69.1	2320	7.28	5270	2.11	BQL	65.7	8.61	27.5	38.7	33.57	0.89	0.78	2.20
XR-8344 SP3	46.9	1.04	1.18	172	57.8	80.6	3180	7.2	5290	2.1	BQL	66.3	10.4	27.7	39	39.45	0.88	0.80	2.21
XR-8345 SP1	48.3	1.55	1.82	195	105	155	5450	10	6150	2.29	BQL	33.1	13.7	32.1	76	35.16	0.85	1.19	2.42
XR-8345 SP2	48.1	1.48	1.74	171	153	177	5700	8.79	5500	2.07	BQL	28.4	13.8	27.6	72.5	32.20	0.85	1.13	2.40
XR-8345 SP3	49.2	1.46	1.71	198	146	174	5590	9.35	5810	2.03	BQL	30.7	13	30.4	81.3	32.13	0.85	1.12	2.39
XR-8346 SP1	78.7	1.34	1.59	354	84.3	122	1460	13.3	6120	2.44	BQL	37.8	10.9	34.3	91.3	11.97	0.84	1.05	2.34
XR-8346 SP2	85.9	1.32	1.63	349	83.9	116	1470	14.8	6170	2.04	BQL	40.5	11.4	33.7	91.4	12.67	0.81	1.03	2.34
XR-8346 SP3	53.6	1.32	1.52	335	78.9	118	1410	12.9	5770	2.48	BQL	37.4	9.85	32.7	89.3	11.95	0.87	1.03	2.34
XR-8347 SP1	45.9	1.28	1.52	190	54.5	119	2170	15.4	6460	2.63	BQL	59.3	11.9	27.1	35.6	18.24	0.84	0.98	2.32
XR-8347 SP2	47.3	1.24	1.42	189	59.3	118	2310	17.1	6110	2.49	BQL	60.4	12	25.2	35.5	19.58	0.87	0.95	2.30
XR-8347 SP3	52.8	1.27	1.49	188	60.6	117	2420	13.4	6410	2.79	BQL	63.6	13.1	26.7	37.5	20.68	0.85	0.97	2.31
XR-8348 SP1	72.2	1.36	1.65	340	65.2	125	2540	22.2	6510	2.28	BQL	45.9	11.8	32.4	74.7	20.32	0.83	1.06	2.35
XR-8348 SP2	71.3	1.37	1.66	361	69.4	125	2700	20	6230	2.48	BQL	43.5	11.3	36.6	94.2	21.60	0.83	1.08	2.36
XR-8348 SP3	64.6	1.04	1.24	239	37.9	93.1	1910	13.4	4540	2.29	BQL	50.9	10.4	23	49.5	20.52	0.83	0.81	2.21
XR-8350 SP1	83.4	1.23	1.50	320	33.6	109	2180	17	5750	2.4	BQL	52.4	10.9	27.2	72.8	20.00	0.82	0.97	2.30
XR-8350 SP2	83.3	1.33	1.58	335	34.8	113	2270	12.4	5870	2.4	BQL	51.5	11.6	29.4	74.9	20.09	0.84	1.04	2.34

XR-8350 SP3	86.6	1.36	1.62	346	38.1	115	2350	15.9	6270	2.59	BQL	55.7	11.2	29.2	73.4	20.43	0.84	1.06	2.35
XR-8351 SP1	48.5	1.16	1.28	159	47.7	75	2190	4.96	4780	2.46	BQL	47.4	11.3	20.4	53.2	29.20	0.91	0.89	2.27
XR-8351 SP2	57.3	1.23	1.38	172	44.7	84.2	2440	5.9	5190	2.51	BQL	50.8	11.8	20.6	52.2	28.98	0.89	0.94	2.30
XR-8351 SP3	54.6	1.17	1.31	162	40.7	74.4	2060	5.45	4630	2.96	BQL	50.2	12	20.1	46.3	27.69	0.89	0.90	2.27
XR-8352 SP1	79.6	1.34	1.54	300	108	174	2370	24.1	8690	2.93	BQL	57.1	13.3	52.6	98.2	13.62	0.87	1.05	2.35
XR-8352 SP2	79.2	1.35	1.51	297	110	167	2110	23.7	8730	2.8	BQL	62.7	12.9	52.4	98.9	12.63	0.89	1.05	2.35
XR-8352 SP3	77.5	1.36	1.53	308	107	170	2250	23.5	8760	2.74	BQL	63.6	13.1	52.3	101	13.24	0.89	1.06	2.35
XR-8353 SP1	82	1.05	1.21	282	51.2	80.9	1900	19.6	5740	2.48	BQL	86.5	12.5	40.4	45.7	23.49	0.87	0.83	2.22
XR-8353 SP2	97	1.08	1.16	385	53.2	89.9	1830	22.3	5660	2.44	BQL	87.4	12.9	42.3	46	20.36	0.93	0.86	2.23
XR-8353 SP3	97.3	1.06	1.13	253	50.5	77.8	1680	20.2	5560	1.94	BQL	74.8	12.8	40.3	46.4	21.59	0.94	0.83	2.22
XR-8355 SP1	75.5	1.46	1.72	315	67	147	1220	23.7	7650	2.83	BQL	47.3	12.7	46.8	98.5	8.30	0.84	1.13	2.39
XR-8355 SP2	76.7	1.44	1.71	307	67.8	145	1270	23.9	7610	2.43	BQL	44.9	12.1	45.6	96.4	8.76	0.84	1.12	2.38
XR-8355 SP3	83.5	1.44	1.72	312	66	144	1510	20.7	7590	2.19	BQL	41.6	12.3	42.4	95.1	10.49	0.84	1.12	2.38
XR-8356 SP1	81.1	1.22	1.47	269	17.5	58.7	997	11.8	5470	2.27	BQL	61.1	9.62	35.3	57.8	16.98	0.83	0.95	2.30
XR-8356 SP2	79	1.23	1.44	268	18.2	59.8	1160	11.4	5360	2.91	BQL	63.9	10.5	35.1	56.7	19.40	0.86	0.96	2.30
XR-8356 SP3	82.3	1.24	1.47	265	18	61.7	1250	15.2	5830	2.92	BQL	64.6	9.1	36.6	55	20.26	0.84	0.96	2.30

*Alkalis: ⁷Li+²³Na+³⁹K+⁸⁵Rb+¹³³Cs

**BQL: Below Quantification Limits.

Table S3. LA-ICP-MS analysis in ppmw of the studied emerald samples from Coscuez, Colombia.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis* (wt%)	H ₂ O (wt%)
RS-6153 SP1	69.1	0.49	0.55	BQL**	52.6	943	336	BQL	523	BQL	BQL	BQL	32.5	0.87	10.1	0.36	0.88	0.37	1.80
RS-6153 SP2	69.1	0.50	0.60	BQL	55.5	910	312	BQL	560	BQL	BQL	BQL	29.4	1.53	11.2	0.34	0.84	0.38	1.81
RS-6153 SP3	68.8	0.46	0.57	BQL	52.2	879	240	BQL	528	BQL	BQL	BQL	29.6	1.21	10	0.27	0.81	0.35	1.77
RS-6154 SP1	66.5	0.51	0.62	BQL	58.3	1010	369	BQL	582	BQL	BQL	BQL	32.8	0.94	10.5	0.37	0.82	0.38	1.82
RS-6154 SP2	70.3	0.55	0.63	BQL	62.6	1040	371	BQL	641	BQL	BQL	BQL	32.2	1.03	11.5	0.36	0.88	0.42	1.87
RS-6154 SP3	65	0.51	0.59	BQL	59.9	1000	367	BQL	586	BQL	BQL	BQL	33	1.02	11.2	0.37	0.87	0.39	1.83
RS-6165 SP1	66.3	0.43	0.49	BQL	41.7	2910	349	BQL	756	BQL	BQL	BQL	55.3	0.88	7.25	0.12	0.88	0.33	1.73
RS-6165 SP2	62	0.40	0.46	BQL	39.9	2870	342	BQL	725	BQL	BQL	BQL	53.8	1.15	6.87	0.12	0.86	0.30	1.69
RS-6165 SP3	62.5	0.42	0.47	BQL	44.8	3020	355	BQL	764	BQL	BQL	BQL	57.9	1.3	7.13	0.12	0.89	0.32	1.72
RS-6166 SP1	64	0.72	0.81	BQL	176	3550	873	BQL	1620	BQL	BQL	BQL	53.9	1.64	9.66	0.25	0.89	0.54	2.01
RS-6166 SP2	66.6	0.74	0.82	BQL	176	3630	882	BQL	1620	BQL	BQL	BQL	58.5	1.75	9.38	0.24	0.91	0.56	2.02
RS-6166 SP3	64.3	0.70	0.78	BQL	171	3520	829	BQL	1510	BQL	BQL	BQL	58.3	1.51	8.92	0.24	0.90	0.53	2.00
RS-6264 SP1	162	0.62	0.66	BQL	9.76	1180	373	BQL	555	BQL	BQL	BQL	27.3	1.08	5.55	0.32	0.94	0.48	1.93
RS-6264 SP2	163	0.58	0.62	BQL	9.17	1090	337	BQL	507	BQL	BQL	BQL	25.7	0.98	4.83	0.31	0.94	0.45	1.89
RS-6264 SP3	156	0.60	0.63	BQL	9.55	1150	347	BQL	555	BQL	BQL	BQL	27.5	0.98	5.88	0.30	0.95	0.46	1.91
RS-6266 SP1	126	0.59	0.65	BQL	16	1390	493	BQL	571	BQL	BQL	BQL	28.6	0.79	5.24	0.35	0.90	0.45	1.90
RS-6266 SP2	131	0.60	0.65	BQL	15.7	1350	491	BQL	601	BQL	BQL	BQL	28.5	1.13	5.58	0.36	0.91	0.46	1.91

RS-6266 SP3	130	0.57	0.66	BQL	17.6	1480	510	BQL	569	BQL	BQL	BQL	29.2	1.25	5.34	0.34	0.86	0.44	1.88
RS-6267 SP1	78.6	0.54	0.59	BQL	167	3140	921	BQL	769	BQL	BQL	BQL	34.9	1.11	7.5	0.29	0.91	0.41	1.85
RS-6267 SP2	75.6	0.52	0.60	BQL	175	3150	930	BQL	782	BQL	BQL	BQL	35.1	1.09	7.69	0.30	0.88	0.40	1.84
RS-6267 SP3	70.6	0.53	0.60	BQL	176	3090	940	BQL	791	BQL	BQL	BQL	34.9	1.1	7.36	0.30	0.88	0.40	1.84
RS-6268 SP1	66.8	0.96	1.01	BQL	429	6020	2700	BQL	1850	BQL	BQL	BQL	47.9	2.47	12.1	0.45	0.94	0.72	2.16
RS-6268 SP2	70.7	0.97	1.04	BQL	441	6340	2820	BQL	1860	BQL	BQL	BQL	48.3	2.17	12	0.44	0.93	0.73	2.17
RS-6268 SP3	68	0.96	1.01	BQL	427	6080	2730	BQL	1840	BQL	BQL	BQL	48.1	2.52	12.1	0.45	0.95	0.72	2.16

*Alkalis: ${}^7\text{Li}+{}^{23}\text{Na}+{}^{39}\text{K}+{}^{85}\text{Rb}+{}^{133}\text{Cs}$

**BQL: Below Quantification Limits.

Table S4. LA-ICP-MS analysis in ppmw of the studied emerald samples from Shakisso, Ethiopia.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis* (wt%)	H ₂ O (wt%)
RS-4489 SP1	355	1.93	2.44	431	134	113	4900	20.6	5150	1.77	BQL**	37.5	19.3	62.7	373	43.36	0.79	1.55	2.54
RS-4489 SP2	371	1.98	2.50	444	139	115	4940	21.1	5140	1.45	BQL	39.3	19.5	64.7	390	42.96	0.79	1.60	2.56
RS-4489 SP3	356	1.97	2.37	422	140	114	4890	21.1	5050	1.59	BQL	39.5	19.5	63.1	381	42.89	0.83	1.58	2.55
RS-4489 SP4	333	1.95	2.35	422	140	117	5010	20.1	4940	1.77	BQL	39.1	19.6	63.3	380	42.82	0.83	1.57	2.55
RS-4489 SP5	314	1.97	2.27	415	135	112	4890	18.7	4970	1.42	BQL	35.5	19	61.3	369	43.66	0.87	1.58	2.55
RS-4491 SP1	420	1.79	2.02	336	117	99.1	2000	18.9	4010	1.67	12.9	39.5	18.5	51.6	289	20.18	0.89	1.44	2.50
RS-4491 SP2	407	1.78	2.07	346	105	96.3	2020	19.2	4000	1.59	BQL	44.8	17.4	51	279	20.98	0.86	1.43	2.50
RS-4491 SP3	426	1.71	2.07	338	110	101	2000	19.2	4060	1.69	14.4	42.7	16.5	51.4	270	19.80	0.83	1.38	2.48
RS-4491 SP4	427	1.77	2.19	336	110	102	2150	19.9	4150	1.62	13.1	39.2	16.7	52.3	280	21.08	0.81	1.42	2.49
RS-4491 SP5	424	1.74	2.24	339	108	102	2090	19	3980	1.5	BQL	38.6	16.4	50.6	275	20.49	0.78	1.40	2.49
RS-4492 SP1	311	2.16	2.34	331	148	114	3800	9.82	5030	2.2	BQL	32.5	19.8	59.1	426	33.33	0.92	1.71	2.60
RS-4492 SP2	285	2.09	2.37	317	147	114	3780	10	5330	1.66	BQL	36.4	19.1	62.1	427	33.16	0.88	1.66	2.58
RS-4492 SP3	291	2.10	2.47	320	150	115	3790	10.4	5240	1.64	BQL	35.2	19.3	58.7	425	32.96	0.85	1.67	2.59
RS-4492 SP4	277	2.05	2.35	304	146	118	3660	10.4	5140	1.27	BQL	34.6	17.9	58.1	414	31.02	0.87	1.63	2.57
RS-4492 SP5	271	2.14	2.40	290	149	123	3700	9	5310	1.87	BQL	35.8	19.7	53.8	427	30.08	0.89	1.69	2.60
RS-4494 SP1	327	2.04	2.49	397	59.7	117	3900	16.2	5180	1.69	12.9	36.4	19	57.8	313	33.33	0.82	1.62	2.57
RS-4494 SP2	351	2.04	2.42	440	66.9	122	4020	17.9	5390	1.73	BQL	33.8	19.2	57.6	306	32.95	0.84	1.63	2.57
RS-4494 SP3	314	1.95	2.42	444	63.2	122	3840	17.5	5050	1.48	BQL	32.2	19.8	57.1	306	31.48	0.81	1.56	2.55

RS-4494 SP4	317	2.00	2.47	400	57	118	3730	14.7	4910	1.61	13.1	35.9	18.6	54.2	314	31.61	0.81	1.59	2.56
RS-4494 SP5	336	2.09	2.55	417	60.6	119	3990	16.4	5310	1.77	BQL	33.5	20.5	58.8	306	33.53	0.82	1.66	2.58

*Alkalis: ${}^7\text{Li}+{}^{23}\text{Na}+{}^{39}\text{K}+{}^{85}\text{Rb}+{}^{133}\text{Cs}$

**BQL: Below Quantification Limits.

Table S5. LA-ICP-MS analysis in ppmw of the studied emerald samples from Mananjary, Madagascar.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis* (wt%)	H ₂ O (wt%)
RS-2971 SP1	127	2.16	2.92	1040	121	385	2540	11	11100	4.24	37.5	18.4	7.1	201	338	6.60	0.74	1.77	2.60
RS-2971 SP2	122	2.13	2.82	1050	118	386	2410	10.8	10900	3.49	35.2	16.7	6.7	195	315	6.24	0.76	1.75	2.60
RS-2971 SP3	128	2.14	2.87	1050	116	376	2430	11.1	10900	3.97	33.1	19.6	6.8	197	324	6.46	0.75	1.76	2.60
RS-2975 SP1	102	2.37	3.02	962	291	367	1710	10.6	9770	3.00	22	32	12.2	50	105	4.66	0.79	1.88	2.65
RS-2975 SP2	103	2.41	2.97	1080	307	374	1690	11.7	9510	2.94	22.6	30.8	13.1	47.9	111	4.52	0.81	1.92	2.66
RS-2975 SP3	97.4	2.40	3.02	1090	309	372	1670	11.8	9650	2.96	20	31.3	12.9	48.2	109	4.49	0.80	1.91	2.66
RS-2977 SP1	106	2.00	2.45	1200	34.9	142	3200	17.8	9970	3.43	33.8	15	10	199	664	22.54	0.81	1.70	2.56
RS-2977 SP2	107	1.93	2.42	1220	34.5	140	3130	17.2	10100	3.30	35.5	16.9	9.9	200	675	22.36	0.80	1.65	2.54
RS-2977 SP3	105	2.02	2.49	1110	34	149	3200	17.6	10300	3.36	33.8	16.1	9.8	197	678	21.48	0.81	1.71	2.57
RS-3005 SP1	115	1.97	2.77	2110	32.9	235	1970	9.7	10100	4.50	31.6	15.1	6.4	205	648	8.38	0.71	1.77	2.55
RS-3005 SP2	115	1.98	2.80	2070	34.3	235	1970	10.1	10200	3.91	34.1	12.7	7.3	211	647	8.38	0.71	1.77	2.56
RS-3005 SP3	114	1.98	2.79	2040	33.4	229	1980	10.3	10100	4.32	28.5	11.1	7.7	203	652	8.65	0.71	1.77	2.56
RS-3007 SP1	61.9	1.87	2.27	725	29.8	153	1530	8.65	7310	2.58	18.1	13	7.9	78.6	245	10	0.82	1.50	2.53
RS-3007 SP2	57.5	1.82	2.19	728	28.3	153	1490	9.23	7310	2.57	24.3	13.8	7.3	76.3	245	9.74	0.83	1.46	2.51
RS-3007 SP3	59.2	1.90	2.21	748	30.1	152	1510	9.78	7540	2.31	18.4	15.8	8.4	79.7	253	9.93	0.86	1.52	2.53
RS-3012 SP1	84.6	2.17	2.40	1090	57.6	228	3700	16.6	10900	3.03	29.6	10.6	6.4	155	453	16.23	0.90	1.79	2.61
RS-3012 SP2	86.8	2.16	2.44	1030	61.3	232	3770	17.3	11000	2.94	32.3	11.6	6.4	145	456	16.25	0.88	1.77	2.60
RS-3012 SP3	82.3	2.16	2.45	914	58.8	231	3530	17.4	10800	2.87	31.8	11.2	6.5	143	470	15.28	0.88	1.76	2.60

RS-3026 SP1	104	2.00	2.07	346	50.9	261	2230	15.3	9260	1.97	20.9	9.7	6.1	45.4	204	8.54	0.96	1.55	2.56
RS-3026 SP2	112	2.01	2.07	339	53.3	264	2560	15.5	9140	1.69	30.6	9.1	6.5	44.9	197	9.70	0.97	1.56	2.56
RS-3026 SP3	109	1.97	2.09	314	52.4	265	2690	15	8920	2.48	22.8	12.6	6.3	42.7	201	10.15	0.94	1.53	2.55
RS-3051 SP1	79.1	1.82	2.57	3030	28.3	142	2790	27.1	10700	3.73	38.6	23.7	7.7	405	1050	19.65	0.71	1.81	2.51
RS-3051 SP2	82	1.87	2.59	3150	29.6	145	2900	28.5	11200	3.48	33.8	20.5	8.1	405	1050	20.00	0.72	1.86	2.53
RS-3051 SP3	80.4	1.87	2.64	3040	30	146	3000	27.4	11100	3.88	37	24.3	8.4	407	1050	20.55	0.71	1.85	2.53
RS-3053 SP1	104	2.09	2.72	1990	21.8	104	1540	17.2	9140	2.77	26.4	11.3	7.7	181	158	14.81	0.77	1.79	2.58
RS-3053 SP2	107	2.09	2.77	2020	21	102	1560	17.6	9060	2.83	26.7	10	8.1	174	154	15.29	0.75	1.80	2.58
RS-3053 SP3	107	2.12	2.82	2010	21.6	103	1570	18.7	9290	2.91	22.5	15.1	8.3	175	158	15.24	0.75	1.82	2.59

*Alkalis: ${}^7\text{Li}+{}^{23}\text{Na}+{}^{39}\text{K}+{}^{85}\text{Rb}+{}^{133}\text{Cs}$

Table S6. LA-ICP-MS analysis in ppmw of the studied emerald samples from Ural, Russia.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis* (wt%)	H ₂ O (wt%)
RS-4501 SP1	843	0.99	0.81	67.8	64.5	114	1680	21.1	1880	1.1	16.8	41.5	17	9.94	317	14.74	1.23	0.86	2.18
RS-4501 SP2	831	0.97	0.80	63.4	63.9	112	1630	20.6	1890	1.37	18.8	40.4	17	9.98	298	14.55	1.22	0.84	2.17
RS-4501 SP3	874	0.99	0.81	BQL**	64.1	114	1700	20.6	1900	1.55	13.4	38.1	17.8	10.3	308	14.91	1.22	0.85	2.18
RS-4504 SP1	750	0.75	0.47	88.9	19.9	47	758	22.6	1220	BQL	20.4	52.2	18.3	26.5	546	16.13	1.58	0.69	2.03
RS-4504 SP2	802	0.70	0.48	BQL	19.6	48.9	724	21.8	1220	1.13	15.9	49.7	19.5	24.1	563	14.81	1.44	0.65	1.99
RS-4504 SP3	816	0.70	0.49	BQL	20	50.2	709	22.2	1210	BQL	BQL	57.5	17.5	24.7	568	14.12	1.42	0.66	1.99
RS-4506 SP1	868	1.23	1.02	102	23.3	33.4	318	15.1	1600	1.94	16	45.3	6.56	26.8	260	9.52	1.21	1.04	2.30
RS-4506 SP2	825	1.18	1.03	103	19.9	31.2	370	14.5	1490	1.66	23.2	45.4	6.28	27.2	252	11.86	1.15	1.00	2.28
RS-4506 SP3	864	1.21	1.04	78.9	19.5	29.8	405	15	1510	2.09	15.7	45.2	6.54	26	259	13.59	1.16	1.02	2.29
RS-4512 SP1	738	0.78	0.60	52	44.2	90.9	793	16.4	1580	1.52	17.6	60.2	12.3	7.88	304	8.72	1.30	0.69	2.05
RS-4512 SP2	736	0.85	0.64	BQL	45.3	91.9	1080	19.7	1670	1.19	17.8	59.7	12.5	8.56	268	11.75	1.34	0.73	2.10
RS-4512 SP3	753	0.87	0.64	57.1	37.3	74.3	848	13.5	1640	1.06	17.9	62.6	12.8	11.2	283	11.41	1.35	0.76	2.11
RS-4514 SP1	911	0.82	0.54	BQL	67.6	121	846	21	1680	BQL	BQL	45.5	13	16.4	323	6.99	1.52	0.73	2.08
RS-4514 SP2	889	0.82	0.57	BQL	72.9	128	841	21.9	1760	1.61	BQL	40.9	13.7	16.3	341	6.57	1.45	0.73	2.08
RS-4514 SP3	904	0.84	0.60	BQL	70.8	123	877	21.4	1760	BQL	BQL	45.1	14.5	16.1	368	7.13	1.40	0.75	2.09

*Alkalis: ⁷Li+²³Na+³⁹K+⁸⁵Rb+¹³³Cs

**BQL: Below Quantification Limits.

Table S7. LA-ICP-MS analysis in ppmw of the studied emerald samples from Kafubu, Zambia.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis* (wt%)	H ₂ O (wt%)
RS-4398 SP1	554.00	2.16	2.54	644	41.2	131	527	15.6	8380	2.57	18.3	23.4	14.7	84.7	1280	4.02	0.85	1.86	2.60
RS-4398 SP2	571.00	2.13	2.50	657	43.2	131	531	16.8	8620	3.19	21.7	25	14.5	86.1	1300	4.05	0.85	1.84	2.60
RS-4398 SP3	591.00	2.25	2.62	679	44.1	135	535	16.3	8700	3.09	21	27.5	15.5	87.3	1330	3.96	0.86	1.94	2.62
RS-4399 SP1	730.00	2.05	2.04	382	46.7	85.5	1490	26.6	9170	2.88	19.1	37.9	15.8	43.2	1160	17.43	1.00	1.75	2.57
RS-4399 SP2	741.00	1.95	2.04	376	47	81.1	1520	25.4	9590	2.78	20.3	35.2	15.1	42.9	1090	18.74	0.96	1.67	2.55
RS-4399 SP3	708.00	1.95	2.02	380	44.4	79.3	1490	26.7	9150	2.70	16.7	35.6	14.6	41.4	1080	18.79	0.97	1.67	2.55
RS-4401 SP1	545.00	2.32	2.52	423	19.8	133	1960	11	6320	2.47	27.1	17.2	12.5	73.8	941	14.74	0.92	1.92	2.64
RS-4401 SP2	508.00	2.18	2.49	451	23.4	138	1890	12.1	6890	2.61	28.4	17.7	11.9	73.7	1070	13.70	0.88	1.83	2.61
RS-4401 SP3	492.00	2.26	2.49	486	24.5	147	1960	11.7	6880	2.60	27.6	17.2	13.5	73.9	1140	13.33	0.91	1.90	2.63
RS-4402 SP1	680.00	1.98	2.06	439	47.3	91.3	349	31.8	7390	3.21	18.4	38.3	16.3	71.1	1360	3.82	0.96	1.73	2.56
RS-4402 SP2	703.00	2.01	2.16	430	49.9	93.7	361	32.1	7510	2.99	14.7	43.7	17.1	74	1410	3.85	0.93	1.75	2.56
RS-4402 SP3	693.00	2.02	2.09	419	49.7	92.6	374	32.3	7600	2.89	19.1	40.8	16.8	73.6	1370	4.04	0.97	1.76	2.57
RS-4403 SP1	671.00	2.16	2.34	460	62	95.3	2360	29.7	8990	2.23	BQL	46.6	15.4	47.4	1050	24.76	0.92	1.82	2.60
RS-4403 SP2	661.00	2.14	2.37	442	62.1	91	2310	29.2	9070	2.86	20.40	43.80	16.90	46.5	1030	25.38	0.90	1.81	2.60
RS-4403 SP3	661.00	2.10	2.57	451	63.4	93	2340	32.2	8960	2.69	19.60	44.10	16.30	47	1050	25.16	0.82	1.78	2.59

RS-4406 SP1	649.00	2.17	2.29	716	25	137	1940	24	8400	2.41	22.00	36.70	13.20	56.7	1380	14.16	0.95	1.89	2.61
RS-4406 SP2	686.00	2.14	2.37	704	28.2	136	1840	16.4	8210	3.26	26.50	19.80	13.60	56.4	1270	13.53	0.90	1.86	2.60
RS-4406 SP3	661.00	2.17	2.32	614	27.5	140	1980	15.4	8480	3.23	19.50	21.00	13.40	54.2	1320	14.14	0.93	1.87	2.61

*Alkalis: ${}^7\text{Li}+{}^{23}\text{Na}+{}^{39}\text{K}+{}^{85}\text{Rb}+{}^{133}\text{Cs}$

**BQL: Below Quantification Limits.

Table S8. LA-ICP-MS analysis in ppmw of the studied emerald samples from Sandawana, Zimbabwe.

Samples	⁷ Li	Na ₂ O (wt%)	MgO (wt%)	³⁹ K	⁴⁵ Sc	⁵¹ V	⁵² Cr	⁵⁵ Mn	⁵⁶ Fe	⁵⁹ Co	⁶⁰ Ni	⁶⁶ Zn	⁶⁹ Ga	⁸⁵ Rb	¹³³ Cs	⁵² Cr/ ⁵¹ V	Na ₂ O/MgO	Alkalis** (wt%)	H ₂ O (wt%)
XR-5068 SP1	554	2.18	2.29	230	26.6	272	2050	74.4	4400	2.43	11.4	83	32.4	221	287	7.53	0.95	1.749	2.609
XR-5068 SP2	512	2.10	2.17	242	25.7	264	1980	84.9	4390	2.4	9.87	80.9	31.2	220	274	7.50	0.97	1.685	2.588
XR-5068 SP3	536	2.18	2.32	245	26.3	275	2070	93	4600	2.51	9.35	77.9	33.5	223	282	7.53	0.94	1.749	2.609
XR-5068 SP4	519	2.14	2.26	234	25.2	266	1990	91	4320	2.55	BQL**	79	32.2	217	279	7.48	0.95	1.715	2.598
XR-5068 SP5	525	2.21	2.37	237	26.8	280	2050	86.6	4640	2.36	11.2	84.4	33.7	220	295	7.32	0.93	1.768	2.615
XR-5071 SP1	917	2.64	2.74	415	18.8	187	1430	48.9	6790	2.32	16	75.2	25.2	279	745	7.65	0.97	2.196	2.711
XR-5071 SP2	930	2.59	2.62	413	18.1	185	1550	50.2	6810	2.06	19.7	73.8	24.8	277	756	8.38	0.99	2.158	2.700
XR-5071 SP3	958	2.63	2.69	407	18.4	188	1530	49	6850	2.11	16.5	72.9	25.4	279	734	8.14	0.98	2.188	2.709
XR-5071 SP4	957	2.62	2.67	411	18.5	187	1550	47	6800	2.28	19.1	78.9	25.7	276	741	8.29	0.98	2.179	2.706
XR-5071 SP5	976	2.66	2.80	427	19.4	188	1560	48.7	6970	2.17	18.5	79.3	25.3	281	751	8.30	0.95	2.214	2.714
XR-5072 SP1	927	2.62	2.74	416	17.9	194	1730	55.4	7050	2.19	18.4	80.9	26.9	288	750	8.92	0.96	2.178	2.706
XR-5072 SP2	933	2.55	2.75	402	19	198	1590	52.9	6870	2.25	16.6	79.3	26.7	290	739	8.03	0.93	2.126	2.692
XR-5072 SP3	984	2.62	2.74	416	17.4	204	1770	54.4	6810	2.17	18	81.7	27	290	754	8.68	0.96	2.184	2.706
XR-5072 SP4	1050	2.75	2.80	434	17.8	204	2020	53.4	6820	1.98	17.9	84.7	27.1	299	743	9.90	0.98	2.293	2.733
XR-5072 SP5	995	2.72	2.74	392	16.9	197	1980	52.9	6820	2.07	17.6	80.5	28.4	292	706	10.05	1.00	2.259	2.728

*Alkalis: ⁷Li+²³Na+³⁹K+⁸⁵Rb+¹³³Cs

**BQL: Below Quantification Limits.