

Table SM 1 Major and trace element concentrations of the Sirstan granitoid (SG) rocks. Eu/Eu*: $\text{Eu}_N/\text{Eu}^*(\text{Sm}_N/\text{Gd}_N)$.

Sample	S4	S6	S12	S14	S17	S19	S27	S29	S30	XeS
SiO ₂ (%)	60.70	61.41	61.13	61.14	57.02	60.05	59.52	59.88	61.09	59.92
TiO ₂	0.63	0.65	0.64	0.62	0.74	0.66	0.71	0.64	0.65	0.63
Al ₂ O ₃	16.69	15.70	15.39	16.02	16.05	15.81	15.36	15.64	15.30	16.20
Fe ₂ O ₃	6.58	6.91	7.04	6.56	8.76	7.65	7.89	7.63	7.33	9.28
MnO	0.14	0.14	0.15	0.14	0.19	0.15	0.15	0.15	0.14	0.12
MgO	2.50	2.56	2.91	2.49	3.99	3.29	3.44	3.31	3.00	3.26
CaO	6.66	6.40	6.80	5.72	7.07	5.67	6.75	5.86	6.60	2.74
Na ₂ O	3.35	3.05	2.99	3.17	3.12	3.13	2.87	2.78	2.90	4.25
K ₂ O	0.80	0.73	1.04	0.55	1.00	1.38	0.89	1.40	0.98	1.09
P ₂ O ₅	0.11	0.11	0.09	0.11	0.10	0.09	0.09	0.10	0.09	0.09
H ₂ O-	0.17	0.07	0.12	0.07	0.00	0.12	0.10	0.00	0.00	0.15
L.O.I	1.38	1.39	1.30	1.91	1.70	1.88	1.86	1.84	1.41	2.78
Total	99.70	99.11	99.61	98.49	99.73	99.87	99.62	99.22	99.47	100.50
(Na ₂ O+K ₂ O)/CaO	0.62	0.59	0.59	0.65	0.58	0.80	0.56	0.71	0.59	1.95
(Na ₂ O+K ₂ O)	4.23	3.87	4.10	3.85	4.20	4.61	3.85	4.29	3.95	5.47
V (ppm)	151	167	185	148	241	200	226	208	196	161
Cr	6.6	7.9	18.3	8.3	20.0	18.3	19.9	19.0	17.9	13.1
Co	32.4	34.6	36.0	37.5	31.5	39.0	39.7	40.3	61.6	17.3
Ni	3.5	24.8	8.7	3.9	9.7	8.3	8.8	7.8	7.7	4.8
Cu	27.8	142	23.5	25.1	63.4	69.3	33.2	42.1	26.3	12.2
Zn	64.5	149	83.6	73.4	96.8	75.9	72.7	73.7	71.0	46.5
Ga	16.7	14.3	14.2	16.2	15.6	14.8	13.9	13.7	14.3	14.6
Rb	16.9	14.9	22.8	10.9	24.6	33.8	23.8	31.5	22.9	27.7
Sr	222	208	187	236	171	142	171	140	183	165
Zr	52.2	57.5	81.6	60.6	59.1	79.5	59.4	45.9	78.8	121
Nb	5.0	5.3	5.1	5.4	4.8	4.6	4.8	4.5	5.5	2.7
Cs	0.5	0.4	0.4	0.4	0.5	0.6	0.7	0.5	0.4	0.7
Ba	236	210	277	198	344	468	245	404	271	284
Pb	5.6	3.2	4.7	6.7	6.1	4.2	3.7	3.1	3.2	4.9
Th	2.2	2.1	2.5	2.4	1.6	2.1	2.4	2.4	2.7	4.4
U	0.5	0.5	0.6	0.6	0.4	0.5	0.6	0.6	0.6	1.0
Y	22.8	25.1	26.8	15.5	23.8	24.0	23.9	21.9	26.2	33.0
La	9.17	8.78	9.06	6.26	8.74	8.47	8.44	7.23	9.01	8.19
Ce	20.0	20.0	20.5	13.7	18.8	19.1	18.7	18.4	20.0	27.0
Pr	2.50	2.60	2.71	1.71	2.51	2.55	2.52	2.22	2.65	2.86
Nd	11.0	11.6	12.2	7.5	10.8	11.5	11.0	10.1	12.1	12.5
Sm	2.98	3.07	3.25	2.03	2.97	3.05	2.91	2.74	3.10	3.64
Eu	0.99	1.02	0.883	0.675	0.897	0.923	0.887	0.809	0.935	0.722
Gd	3.28	3.67	3.93	2.24	3.50	3.59	3.42	3.27	3.79	4.70
Tb	0.574	0.630	0.684	0.392	0.559	0.594	0.624	0.593	0.720	0.868

Dy	3.84	4.29	4.54	2.62	4.10	4.14	4.30	4.00	4.53	6.16
Ho	0.868	0.861	1.01	0.592	0.889	0.901	0.937	0.885	0.994	1.37
Er	2.54	2.84	2.84	1.74	2.76	2.71	2.79	2.64	2.89	4.26
Tm	0.410	0.420	0.422	0.280	0.423	0.427	0.403	0.360	0.458	0.662
Yb	2.63	2.86	3.23	1.80	2.87	2.72	2.78	2.67	2.93	4.60
Lu	0.417	0.458	0.441	0.284	0.443	0.403	0.406	0.407	0.481	0.683
Hf	1.90	2.18	2.91	2.14	2.06	2.66	2.27	1.91	2.81	4.08
Ta	0.390	0.393	0.355	0.360	0.320	0.330	0.409	0.428	0.472	0.162
(La/Yb) _N	2.50	2.21	2.01	2.50	2.18	2.23	2.17	1.94	2.21	1.28
10000*Ga/Al	1.85	1.68	1.71	1.84	1.80	1.73	1.67	1.61	1.74	1.70
K/Rb	397	418	385	433	345	347	318	379	360	333
Rb/Sr	0.076	0.072	0.122	0.046	0.143	0.237	0.139	0.226	0.125	0.168
Th/Ta	5.51	5.45	7.02	6.78	4.84	6.42	5.98	5.51	5.74	27.4
Ta/Yb	0.15	0.14	0.11	0.20	0.11	0.12	0.15	0.16	0.16	0.04
Th/Yb	0.82	0.75	0.77	1.36	0.54	0.78	0.88	0.88	0.93	0.97

Eu/Eu*:Eu_N/(Sm_N.Gd_N)

Table SM 2 LA-ICP-MS analyses for zircon grains from the Sirstan granitoid (SG) rocks

Spot	Th/U	²⁰⁶ Pb _c * (%)	²⁰⁷ Pb/ ²⁰⁶ Pb	±Error 2□	²⁰⁶ Pb/ ²³⁸ U	±Error 2□	²⁰⁷ Pb/ ²³⁵ U	±Error 2□	²³⁸ U/ ²⁰⁶ Pb age (Ma)	±Error 2□	²³⁵ U/ ²⁰⁷ Pb age (Ma)	±Error 2□
SG 1												
SG-1-04	0.74	1.33	0.0514	0.0054	0.01670	0.00056	0.1183	0.0130	106.8	3.6	113.5	12.5
SG-1-07	0.62	0.00	0.0495	0.0076	0.01734	0.00072	0.1185	0.0188	110.8	4.6	113.7	18.1
SG-1-09	0.75	6.46	0.0441	0.0067	0.01705	0.00068	0.1037	0.0163	109.0	4.4	100.2	15.7
SG-1-11	0.82	0.00	0.0503	0.0088	0.01712	0.00085	0.1188	0.0216	109.4	5.4	114.0	20.7
SG-1-12	0.38	0.00	0.0508	0.0091	0.01660	0.00083	0.1163	0.0216	106.2	5.3	111.7	20.7
SG-1-13	0.68	12.78	0.0465	0.0086	0.01684	0.00084	0.1078	0.0206	107.6	5.4	104.0	19.9
SG-1-14	0.56	0.00	0.0502	0.0066	0.01739	0.00074	0.1203	0.0166	111.1	4.7	115.4	16.0
SG-1-15	0.87	0.00	0.0464	0.0075	0.01713	0.00079	0.1095	0.0184	109.5	5.1	105.5	17.8
SG-1-16	0.82	1.43	0.0524	0.0076	0.01732	0.00078	0.1251	0.0191	110.7	5.0	119.7	18.3
SG-1-18	0.66	7.53	0.0545	0.0101	0.01751	0.00092	0.1316	0.0252	111.9	5.9	125.5	24.1
SG-1-19	0.71	3.37	0.0456	0.0088	0.01709	0.00083	0.1073	0.0214	109.2	5.3	103.5	20.6
SG-1-20	1.00	0.00	0.0512	0.0067	0.01701	0.00067	0.1200	0.0164	108.8	4.3	115.1	15.7
SG-1-22	0.56	10.79	0.0438	0.0150	0.01790	0.00130	0.1082	0.0379	114.4	8.3	104.3	36.5
SG-1-23	0.80	0.00	0.0487	0.0092	0.01737	0.00084	0.1167	0.0228	111.0	5.4	112.1	21.9
SG-1-25	0.86	2.09	0.0480	0.0072	0.01716	0.00072	0.1135	0.0177	109.7	4.6	109.2	17.0
SG-1-26	0.82	0.00	0.0534	0.0098	0.01677	0.00082	0.1235	0.0234	107.2	5.2	118.3	22.4
SG-1-27	0.72	0.00	0.0495	0.0103	0.01641	0.00086	0.1119	0.0241	104.9	5.5	107.7	23.2
SG-1-29	0.83	0.00	0.0497	0.0085	0.01675	0.00080	0.1147	0.0205	107.1	5.1	110.3	19.7
SG-1-30	0.71	0.00	0.0552	0.0116	0.01779	0.00101	0.1354	0.0295	113.7	6.4	128.9	28.1
SG-1-33	0.84	0.20	0.0507	0.0062	0.01834	0.00074	0.1282	0.0166	117.1	4.7	122.5	15.8
SG-1-39	0.86	0.00	0.0504	0.0085	0.01615	0.00098	0.1122	0.0201	103.3	6.3	108.0	19.4
SG-1-41	0.72	12.56	0.0464	0.0095	0.01628	0.00105	0.1041	0.0225	104.1	6.7	100.6	21.7
SG-1-42	0.78	0.29	0.0445	0.0088	0.01716	0.00108	0.1052	0.0219	109.7	6.9	101.6	21.1
SG-1-43	0.85	0.90	0.0489	0.0077	0.01746	0.00103	0.1177	0.0199	111.6	6.6	113.0	19.1
SG 2												
SG-2-1	0.91	0.00	0.0507	0.0060	0.01668	0.00061	0.1166	0.0146	106.7	3.9	112.0	14.0
SG-2-2	0.43	9.80	0.0526	0.0063	0.01787	0.00066	0.1297	0.0163	114.2	4.2	123.8	15.6
SG-2-5	0.61	2.93	0.0544	0.0074	0.01817	0.00073	0.1363	0.0192	116.1	4.7	129.7	18.3
SG-2-6	0.69	0.03	0.0568	0.0095	0.01735	0.00081	0.1358	0.0236	110.9	5.2	129.3	22.5
SG-2-15	0.75	0.00	0.0521	0.0055	0.01801	0.00064	0.1295	0.0143	115.1	4.1	123.6	13.7
SG-2-21	0.74	7.92	0.0568	0.0098	0.01952	0.00084	0.1528	0.0271	124.6	5.3	144.3	25.6
SG-2-26	0.50	2.66	0.0553	0.0102	0.01966	0.00088	0.1499	0.0284	125.5	5.6	141.8	26.8
SG-2-34	0.43	0.00	0.0455	0.0079	0.01772	0.00072	0.1112	0.0197	113.2	4.6	107.0	19.0
SG-2-37	0.46	1.19	0.0510	0.0047	0.01960	0.00069	0.1377	0.0135	125.1	4.4	131.0	12.8
SG-2-43	0.42	2.29	0.0499	0.0057	0.01680	0.00064	0.1156	0.0139	107.4	4.1	111.1	13.4

²⁰⁶Pb_c percentage contributed by common Pb on the basis of the ²⁰⁴Pb signal. The common Pb value was assumed to be that proposed by Stacey and Kramers (1975).

Table SM 3 Sr–Nd isotope ratios for whole-rock samples from the Sirstan granitoid (SG) samples.

Sample	$^{87}\text{Rb}/^{86}\text{Sr}$	$^{87}\text{Sr}/^{86}\text{Sr}$	± 2 S.E.	$^{147}\text{Sm}/^{144}\text{Nd}$	$^{143}\text{Nd}/^{144}\text{Nd}$	± 2 S.E.	$^{87}\text{Sr}/^{86}\text{Sr}(i)$	$^{143}\text{Nd}/^{144}\text{Nd}(i)$	$\square_{\text{Nd}}(t=110)$
S4	0.220	0.705123	0.000011	0.163	0.512619	0.000010	0.704778	0.512502	0.1
S6	0.207	0.705087	0.000015	0.160	0.512750	0.000010	0.704763	0.512635	2.7
S12	0.354	0.705216	0.000014	0.162	0.512742	0.000007	0.704662	0.512626	2.5
S14	0.133	0.705017	0.000014	0.163	0.512737	0.000010	0.704808	0.512620	2.4
S17	0.415	0.705084	0.000014	0.166	0.512741	0.000009	0.704435	0.512621	2.4
S19	0.686	0.705431	0.000012	0.160	0.512744	0.000008	0.704359	0.512629	2.6
S27	0.403	0.705306	0.000011	0.160	0.512740	0.000008	0.704675	0.512625	2.5
S29	0.653	0.705424	0.000014	0.164	0.512738	0.000009	0.704403	0.512620	2.1
S30	0.363	0.705310	0.000011	0.155	0.512738	0.000007	0.704743	0.512627	2.5
XeS	0.487	0.706464	0.000012	0.176	0.512743	0.000007	0.705702	0.512617	2.3

The Sr and Nd natural isotope ratios were normalized based on $^{86}\text{Sr}/^{88}\text{Sr} = 0.1194$ and $^{146}\text{Nd}/^{144}\text{Nd} = 0.7219$. The average and 1σ for isotope ratio standards are JNdi-1 = 0.512097 ± 0.000010 ($n = 13$) and for NBS987 = 0.710240 ± 0.000010 ($n = 17$). CHUR (Chondritic Uniform Reservoir) values, $^{147}\text{Sm}/^{144}\text{Nd} = 0.1967$, and $^{143}\text{Nd}/^{144}\text{Nd} = 0.512638$ were used to calculate ϵ_{Nd} (DePaolo and Wasserburg, 1976).