6000 1978

Mining District File Summary Sheet

DISTRICT	Rosebud
DIST_NO	4010
COUNTY If different from written on document	Pershing
TITLE If not obvious	Rosebud - Age dates
AUTHOR	Allen K; Spell T; Vance R
DATE OF DOC(S)	1999-2000
MULTI_DIST Y / N? Additional Dist_Nos:	
QUAD_NAME	Sulphur 7½'
P_M_C_NAME (mine, claim & company names)	Rosebud Mine; Rosebud Mining Co. Nevada Isotope Geochronology Laboratory North Zone; East Zone; White Alps
COMMODITY If not obvious	gold; silver
NOTES	Sample description; age date data tables; correspondence; invoice; $^{40}Ar/^{39}Ar$ dates 26p.

Keep docs at about 250 pages if no oversized maps attached (for every 1 oversized page (>11x17) with text reduce the amount of pages by ~25)

	Initials	Date
SS:	DR	9/12/08
DB:		
SCANNED:		

Revised: 1/22/08

AGE DATES

60001978 4010

Nevada Isotope Geochronology Laboratory

Kurt Allen - Rose Bud Mining Company - $^{40}Ar/^{39}Ar$ Sample Description

June 3, 2000

64320 Alunite

This sample gave a fairly simple age spectrum with ~98% of the gas released in 3 steps (2-4), at very low temperatures of 500-540 °C (due to fine grain size), yielding ages of ~550-700 ka. The initial and final steps have older ages, but account for <2% of the total gas released. Steps 2-4 do not define a plateau as the ages are different at the 2σ analytical level. The total gas age for this sample (equivalent to a K/Ar date) is 610 ± 10 ka, not significantly different from the average of steps 2-4 which is 620 ± 80 ka. As this was a fine grained sample there may be concerns about loss of ^{39}Ar due to recoil during irradiation. However, two indicators of recoil, anomalously old ages (especially in the early gas released) followed by decreasing ages with progressive heating steps, and ages older than allowed by geologic constraints, appear to be absent from this sample. Thus, it is not likely that recoil loss is a significant problem. The overall form of the age spectrum, with higher initial and final ages is an indicator of possible excess argon. Isochron analysis yields a valid isochron (low MSWD) which defines and age of 616 ± 20 ka and trapped (initial) argon with a slightly higher than atmospheric value (atmospheric $^{40}Ar/^{36}Ar = 295.5$) showing that a small amount of excess argon may be present. The best estimate of the age of this sample is the isochron age, as this makes no assumption regarding the isotopic composition of the non-radiogenic, or trapped, argon.

34-3-1 Illite

This sample gave an age spectrum with an initial step age of ~20.5 Ma, followed by a plateau segment (all ages identical within 2σ analytical errors) defined by steps 2-6, and slightly younger ages with the final gas released. The plateau, comprising ~59% of the total ^{39}Ar argon released, gives an age of 16.26 ± 0.18 Ma, not significantly different from the total gas age of 16.57 ± 0.18 Ma. As this is a fine grained sample, there may again be concern regarding loss of ^{39}Ar due to recoil. The higher initial age and overall

decrease in age with progressive step heating could be an indicator of recoil loss. However, it could also be an indicator of excess argon. Isochron analysis reveals that steps 2-9, comprising 88% of the total gas released, define a valid age of 14.10 ± 0.80 Ma and a non-radiogenic argon $^{40}Ar/^{36}Ar$ ratio which suggests the presence of some excess argon. As discussed above, the isochron age is preferrable as it makes no assumption regarding the composition of the non-radiogenic argon (ages for the spectra are often referred to as apparent ages, as they are calculated assuming the non-radiogenic argon has atmospheric composition).

Please feel free to call or e-mail us if there are any questions regarding these analyses or their interpretation.

Terry Spell

Henry -NBMG, 64320 alunite, 12.50 mg, J = 0.00030+/- 0.5%
4 amu discrimination = 1.01843 +/- 0.27%, 40/39K =0.0355 +/- 43.55%, 36/37Ca = 0.0003379 +/- 11.94%, 39/37Ca = 0.0009109 +/- 26.47%

step	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.
1	450	12	0.521	0.069	0.318	5.946	158.953	6.2	1.2	0.07045464	1.4655	0.79	0.14
2	500	12	0.902	0.104	8.086	163.705	427.128	40.0	33.2	0.003856986	0.9979	0.54	0.01
3	525	12	1.317	0.115	12.146	259.439	688.365	44.5	52.6	0.002691158	1.1531	0.62	0.01
4	540	12	0.718	0.081	2.377	61.759	288.656	29.4	12.5	0.00796273	1.2881	0.70	0.02
5	560	12	0.148	0.062	0.077	1.571	44.353	9.9	0.3	0.239619974	1.6005	0.87	0.45
6	610	12	0.129	0.062	0.012	0.169	37.176	5.0	0.0	2.228806073	5.3033	2.87	4.17
7	1000	12	0.277	0.068	0.073	0.329	83.26	5.0	0.1	1.255316379	9.7125	5.25	0.67
											Total gas age =	0.61	0.01

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

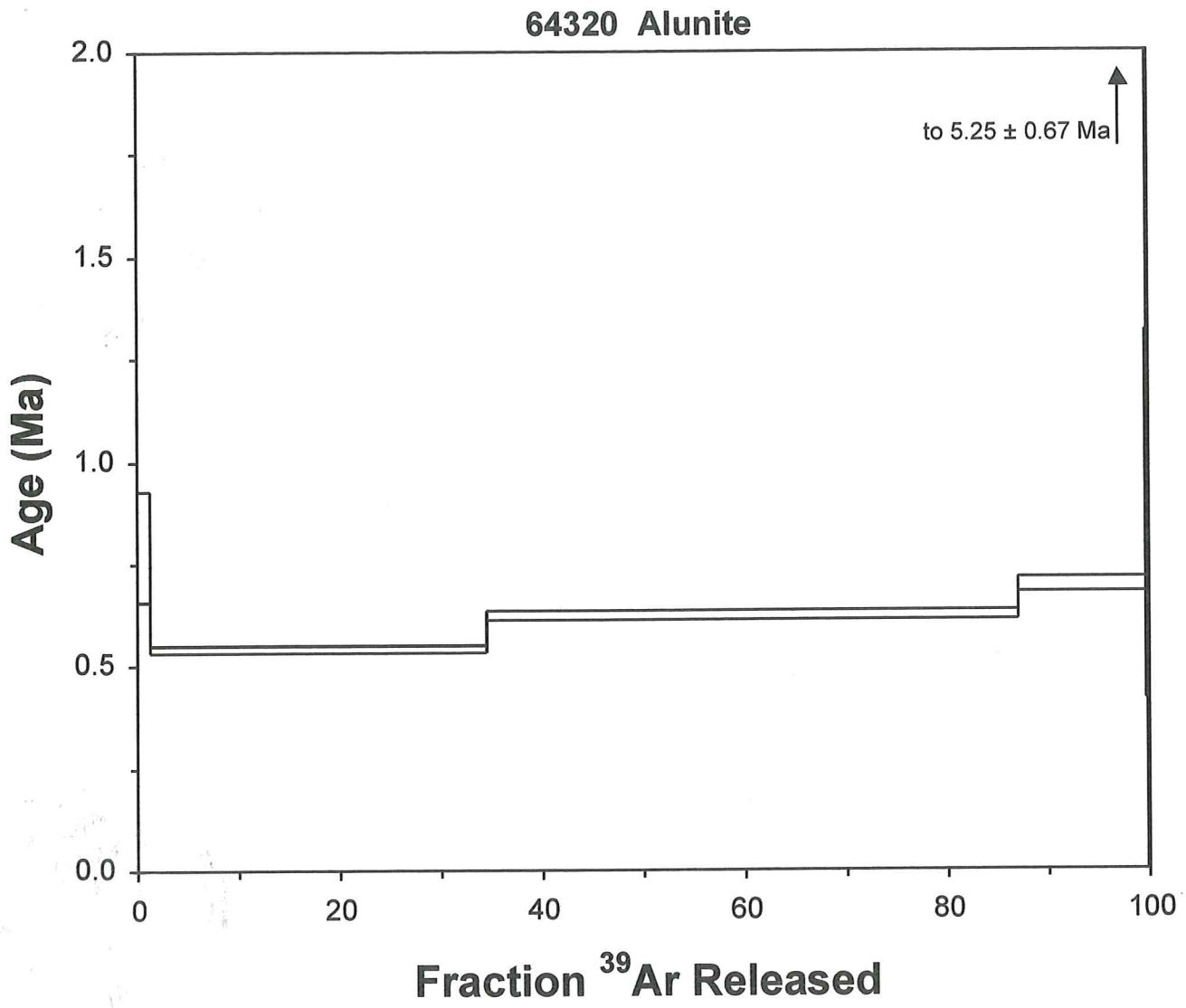
Henry -NBMG, 64320 alunite, 12.50 mg, J = 0.00030+/- 0.5%
4 amu discrimination = 1.01843 +/- 0.27%, 40/39K =0.0355 +/- 43.55%, 36/37Ca = 0.0003379 +/- 11.94%, 39/37Ca = 0.0009109 +/- 26.47%

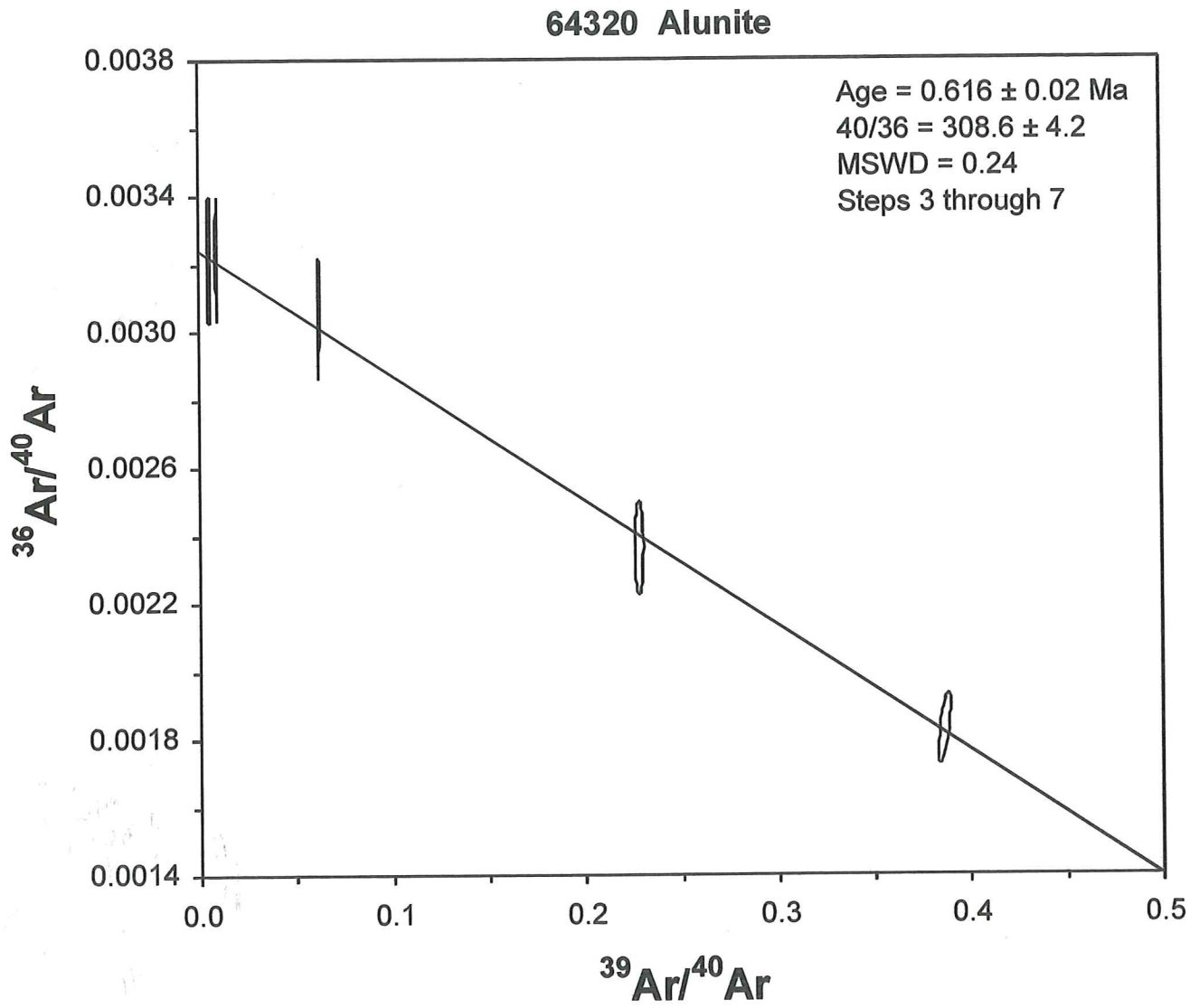
step	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	450	12	0.521	0.069	0.318	5.946	158.953	6.2	1.2	0.07045464	1.4655	0.79	0.14	0.13494176	0.030632	99.99788059	492.92	3.57E-16	0.79	0.134942	54.917	43.54923
2	500	12	0.902	0.104	8.086	163.705	427.128	40.0	33.2	0.003856986	0.9979	0.54	0.01	0.0096286	0.001677	99.99988397		9.82E-15	0.54	0.009629	10786	5824.614
3	525	12	1.317	0.115	12.146	259.439	688.365	44.5	52.6	0.002691158	1.1531	0.62	0.01	0.00950082	0.001170	99.99991904		1.56E-14	0.62	0.009501	11078	6912.933
4	540	12	0.718	0.081	2.377	61.759	288.656	29.4	12.5	0.00796273	1.2881	0.70	0.02	0.01663895	0.003462	99.99976046		3.71E-15	0.70	0.016639	3612	2517.565
5	560	12	0.148	0.062	0.077	1.571	44.353	9.9	0.3	0.239619974	1.6005	0.87	0.45	0.44897912	0.104175	99.99279213		9.43E-17	0.87	0.448979	4.9608	4.296013
6	610	12	0.129	0.062	0.012	0.169	37.176	5.0	0.0	2.228806073	5.3033	2.87	4.17	4.16697533	0.968397	99.93299662		1.01E-17	2.87	4.166975	0.0576	0.165172
7	1000	12	0.277	0.068	0.073	0.329	83.26	5.0	0.1	1.255316379	9.7125	5.25	0.67	0.66748423	0.545584	99.96225106		1.97E-17	5.25	0.667484	2.2445	11.78134
											Total gas age =	0.61	0.01							WtdMean	1sd	wJ
																				0.599669	0.0063	0.012869

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

Cumulative %39Ar rlsd = 100.0

step	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	blnk corr beam errors %36err	%40err	WtdAge39Ar
1	0.04234	0.5686	0.0031678	2.3765	0.5483	0.45	5.95	139.79	0.24	0.34	0.32	2.332	0.367	0.009565808
2	0.39943	0.3404	0.0020025	2.3505	0.4090	0.83	163.71	407.97	0.17	0.05	0.09	2.326	0.201	0.179340867
3	0.3859	0.3251	0.0018297	2.3428	0.7036	1.25	259.44	669.21	0.02	0.002	0.02	2.320	0.181	0.328430447
4	0.22811	0.3941	0.002361	2.3720	0.0192	0.65	61.76	269.50	0.37	0.22	0.04	2.349	0.184	0.087328619
5	0.06207	0.4002	0.0030401	2.3754	0.3513	0.08	1.57	25.19	0.35	0.15	0.18	2.346	0.255	0.002760054
6	0.00934	2.2147	0.0032156	2.3843	0.0037	0.06	0.17	18.02	0.44	2.19	0.06	2.361	0.190	0.000983308
7	0.00518	0.6566	0.0032125	2.3856	0.0035	0.21	0.33	63.27	0.45	0.57	0.03	2.363	0.182	0.003503451


64320 Alunite
to 5.25 ± 0.67 Ma
Age (Ma)
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
Fraction 39Ar Released


64320 Alunite
Age = 0.616 ± 0.02 Ma
40/36 = 308.6 ± 4.2
MSWD = 0.24
Steps 3 through 7
0.0038
0.0034
0.0030
0.0026
0.0022
0.0018
0.0014
36Ar/40Ar
0.0
0.1
0.2
0.3
0.4
0.5
39Ar/40Ar

Henry -NBMG, 34-3-1, 10.23 mg illite, J = 0.000385+/- 0.5%

4 amu discrimination = 1.01843 +/- 0.27%, 40/39K =0.0355 +/- 43.55%, 36/37Ca = 0.0003379 +/- 11.94%, 39/37Ca = 0.0009109 +/- 26.47%

step	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.
1	450	12	2.033	0.441	0.597	15.249	1040.207	43.9	11.8	0.178620721	29.6451	20.47	0.23
2	465	12	0.744	0.215	0.241	6.654	371.249	43.6	5.1	0.199568969	23.4884	16.24	0.23
3	485	12	0.973	0.315	0.36	10.708	536.004	48.6	8.3	0.181692586	23.8008	16.46	0.30
4	505	12	1.355	0.453	0.496	16.142	766.049	50.0	12.5	0.173330417	23.2284	16.06	0.16
5	525	12	1.548	0.56	0.591	20.824	940.62	53.4	16.1	0.166095111	23.7150	16.40	0.17
6	545	12	1.434	0.585	0.555	21.6	922.393	56.1	16.7	0.167276621	23.5538	16.29	0.19
7	575	12	1.439	0.645	0.593	24.16	963.956	57.9	18.7	0.164890489	22.7214	15.71	0.13
8	615	12	0.698	0.319	0.285	10.954	439.579	56.6	8.5	0.17986751	21.8081	15.08	0.15
9	675	12	0.274	0.129	0.094	2.704	135.564	51.2	2.1	0.294667879	21.9547	15.19	0.29
10	1000	12	0.091	0.078	0.034	0.371	36.611	80.7	0.3	1.298977552	36.1594	24.94	1.27
											Total gas age =	16.57	0.18
											Plateau age =	16.26	0.18
											Steps 2-6		

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma

(Not corrected for decay)

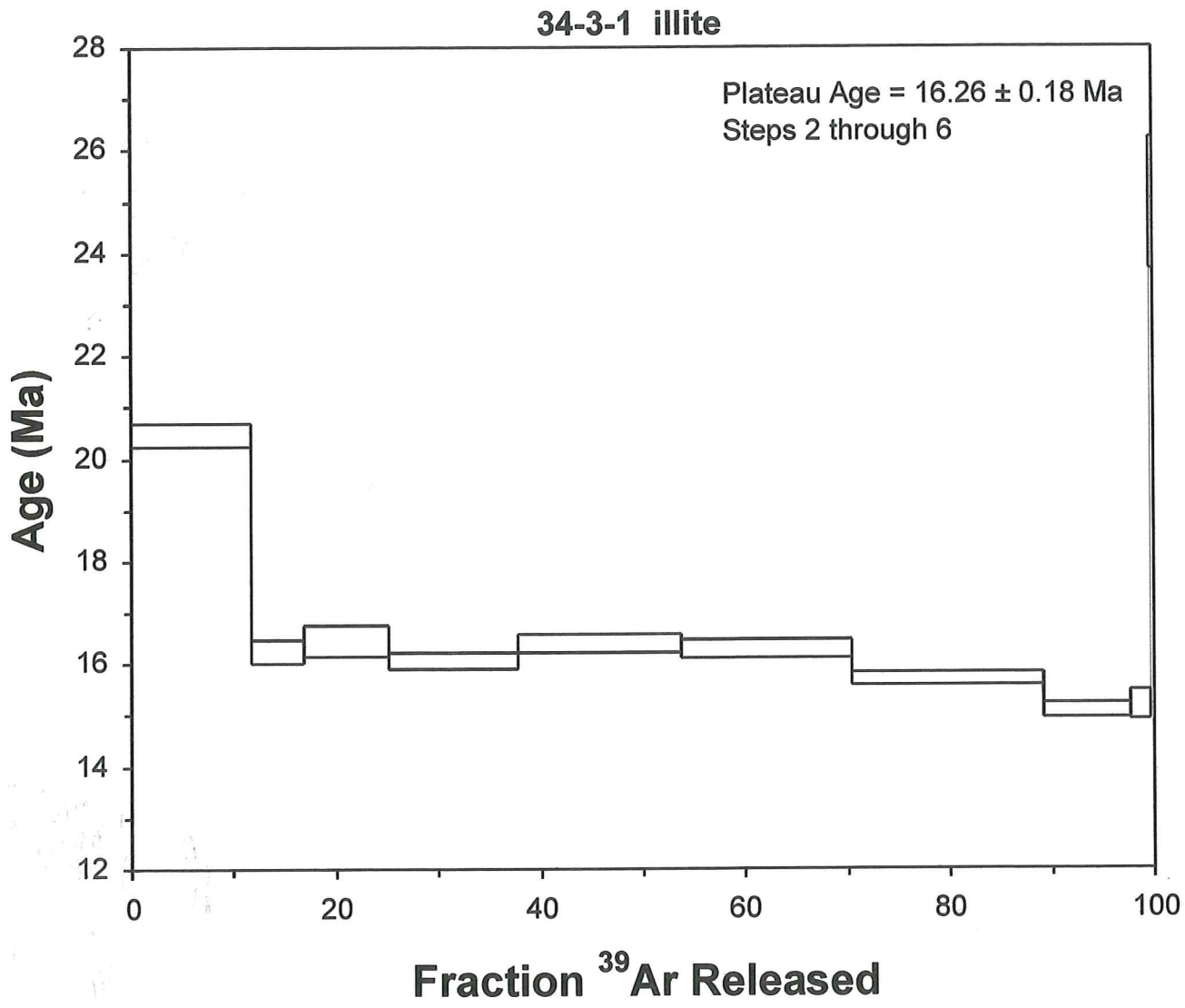
Henry -NBMG, 34-3-1, 10.23 mg illite, J = 0.000385+/- 0.5%
4 amu discrimination = 1.01843 +/- 0.27%, 40/39K =0.0355 +/- 43.55%, 36/37Ca = 0.0003379 +/- 11.94%, 39/37Ca = 0.0009109 +/- 26.47%

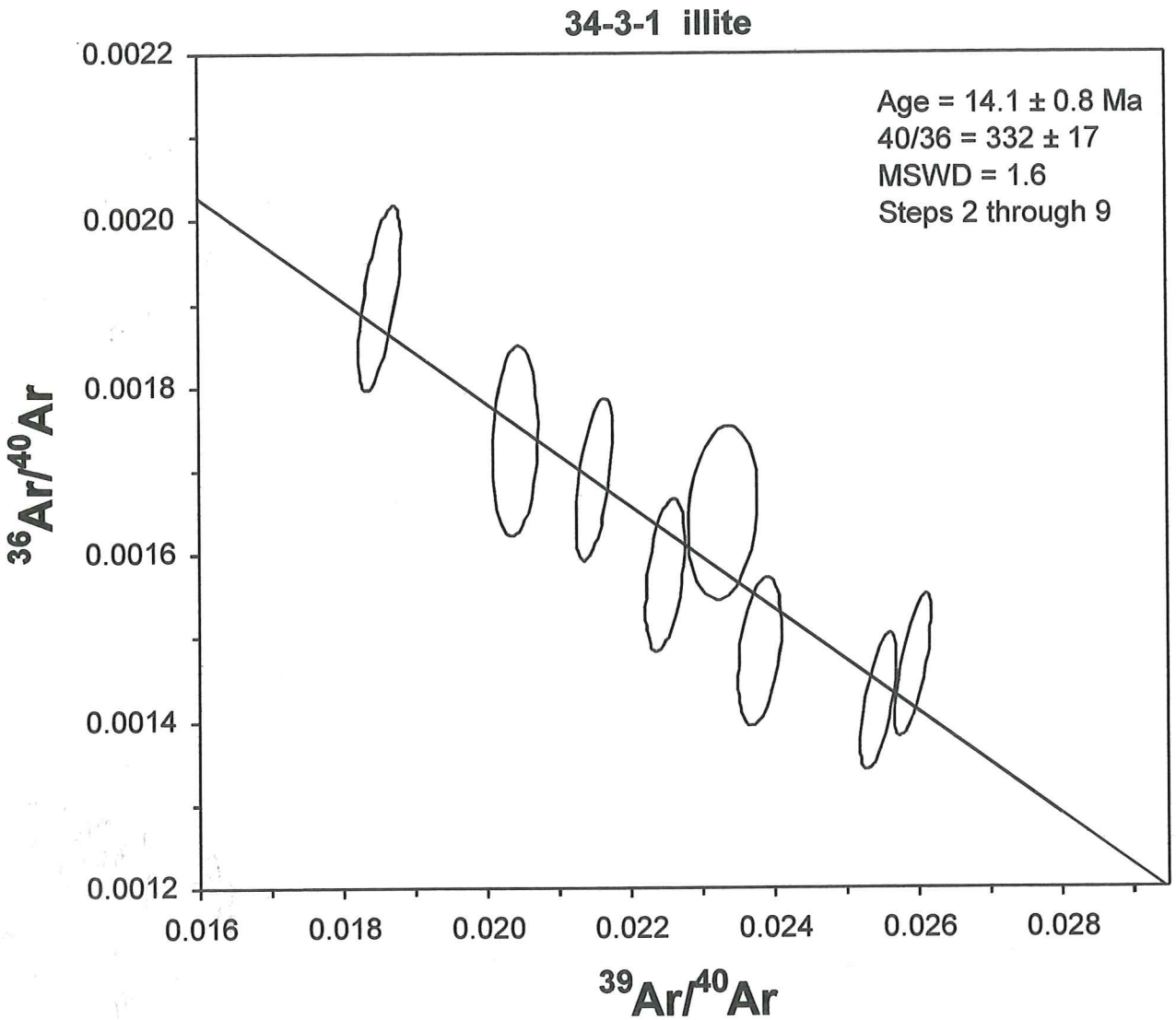
step	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	450	12	2.033	0.441	0.597	15.249	1040.207	43.9	11.8	0.178620721	29.6451	20.47	0.23	0.20148544	0.077657	99.99462691	129.37	9.15E-16	20.47	0.201485	24.633	504.3306
2	465	12	0.744	0.215	0.241	6.654	371.249	43.6	5.1	0.199568969	23.4884	16.24	0.23	0.21625621	0.086764	99.99399681		3.99E-16	16.24	0.216256	21.383	347.2767
3	485	12	0.973	0.315	0.36	10.708	536.004	48.6	8.3	0.181692586	23.8008	16.46	0.30	0.29057529	0.078992	99.99453451		6.42E-16	16.46	0.290575	11.844	194.8978
4	505	12	1.355	0.453	0.496	16.142	766.049	50.0	12.5	0.173330417	23.2284	16.06	0.16	0.14299057	0.075357	99.99478604		9.69E-16	16.06	0.142991	48.909	785.5699
5	525	12	1.548	0.56	0.591	20.824	940.62	53.4	16.1	0.166095111	23.7150	16.40	0.17	0.14549041	0.072212	99.99500368		1.25E-15	16.40	0.14549	47.242	774.6324
6	545	12	1.434	0.585	0.555	21.6	922.393	56.1	16.7	0.167276621	23.5538	16.29	0.19	0.16722785	0.072725	99.99496814		1.3E-15	16.29	0.167228	35.759	582.3676
7	575	12	1.439	0.645	0.593	24.16	963.956	57.9	18.7	0.164890489	22.7214	15.71	0.13	0.10607328	0.071688	99.99503991		1.45E-15	15.71	0.106073	88.877	1396.52
8	615	12	0.698	0.319	0.285	10.954	439.579	56.6	8.5	0.17986751	21.8081	15.08	0.15	0.12966042	0.078199	99.99458941		6.57E-16	15.08	0.12966	59.482	897.2257
9	675	12	0.274	0.129	0.094	2.704	135.564	51.2	2.1	0.294667879	21.9547	15.19	0.29	0.27677499	0.128105	99.99113641		1.62E-16	15.19	0.276775	13.054	198.2262
10	1000	12	0.091	0.078	0.034	0.371	36.611	80.7	0.3	1.298977552	36.1594	24.94	1.27	1.26687664	0.564552	99.96093863		2.23E-17	24.94	1.266877	0.6231	15.54042
											Total gas age =	16.57	0.18							WtdMean	1sd	wJ
											Plateau age =	16.26	0.18							16.25778	0.0778	0.175586
											Steps 2-6											

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

Cumulative %39Ar rlsd = 100.0

step	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	blnk corr beam errors %36err	%40err	WtdAge39Ar			
1	0.01479	0.4645	0.0018973	2.3739	0.4510	1.98	15.25	1026.25	0.3	0.23	0.24	2.339	0.300	2.413295401	1	20.07103	20.87697
2	0.01854	0.6592	0.0019073	2.3737	0.6565	0.69	6.65	357.29	0.05	0.43	0.38	2.321	0.420	0.835337513	2	15.80849	16.67351
3	0.02042	0.6370	0.0017361	2.6816	0.1616	0.92	10.71	522.04	1.26	0.43	0.34	2.640	0.385	1.362068857	3	15.87485	17.03715
4	0.02151	0.4970	0.0016893	2.3574	0.5796	1.29	16.14	746.89	0.11	0.29	0.24	2.323	0.300	2.004118451	4	15.77602	16.34798
5	0.0225	0.4958	0.0015749	2.3811	0.4561	1.48	20.82	921.46	0.33	0.26	0.27	2.343	0.324	2.639337775	5	16.10602	16.68798
6	0.0238	0.5148	0.0014828	2.4574	0.3896	1.36	21.60	903.23	0.66	0.21	0.34	2.412	0.385	2.719159001	6	15.95154	16.62046
7	0.02545	0.4124	0.0014228	2.3505	0.6590	1.37	24.16	944.80	0.07	0.18	0.18	2.321	0.255	2.934421272	7	15.50085	15.92515
8	0.02594	0.4047	0.0014667	2.3561	0.7224	0.63	10.95	420.42	0.14	0.12	0.21	2.324	0.277	1.277190508	8	14.82468	15.34332
9	0.0233	0.8484	0.0016492	2.5691	0.1840	0.19	2.70	115.50	0.98	0.68	0.39	2.518	0.430	0.317386102	9	14.63145	15.73855
10	0.02231	0.6470	0.0006526	3.4228	0.1263	0.01	0.37	16.55	2.46	0.37	0.42	3.381	0.457	0.071527263	10	22.40825	27.47575


34-3-1 illite
Plateau Age = 16.26 ± 0.18 Ma
Steps 2 through 6
Age (Ma)
28
26
24
22
20
18
16
14
12
0
20
40
60
80
100
Fraction 39Ar Released


34-3-1 illite
Age = 14.1 ± 0.8 Ma
40/36 = 332 ± 17
MSWD = 1.6
Steps 2 through 9
0.0022
0.0020
0.0018
0.0016
0.0014
0.0012
36Ar/40Ar
0.016
0.018
0.020
0.022
0.024
0.026
0.028
39Ar/40Ar

Henry-NBMG, NWRA 2651, sanidine, J = 0.0009488 +/- 0.5%
4 amu discrimination = 1.01753 +/- 0.34%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

Crystal	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor
1	1600	6	0.05	0.315	0.648	49.249	766.167	98.9	8.0	0.031105617	15.3445	26.08	0.17	0.1137104	0.011521	99.9992029	614.06	2.95E-15	26.08	0.1137104	77.339188
2	1600	6	0.48	0.521	1.074	73.836	1264.262	89.4	12.0	0.034315917	15.3072	26.01	0.18	0.12005039	0.012709	99.99912063		4.43E-15	26.01	0.12005039	69.386161
3	1600	6	0.05	0.385	0.728	55.726	862.372	99.1	9.1	0.033599191	15.3036	26.01	0.17	0.11410477	0.012444	99.999139		3.34E-15	26.01	0.11410477	76.805513
4	1600	6	0.27	0.641	1.284	93.085	1499.022	95.1	15.2	0.033489162	15.3297	26.05	0.18	0.11687016	0.012403	99.99914182		5.59E-15	26.05	0.11687016	73.213758
5	1600	6	0.04	0.267	0.513	39.524	612.422	99.2	6.4	0.032853092	15.3054	26.01	0.17	0.11408767	0.012168	99.99915812		2.37E-15	26.01	0.11408767	76.828534
6	1600	6	0.64	0.625	1.282	89.388	1552.452	88.3	14.6	0.03400375	15.3534	26.09	0.18	0.12110117	0.012594	99.99912863		5.36E-15	26.09	0.12110117	68.187275
7	1600	6	0.12	0.441	0.846	62.112	984.679	97.1	10.1	0.034529409	15.3759	26.13	0.17	0.11492556	0.012789	99.99911516		3.73E-15	26.13	0.11492556	75.712355
8	1600	6	0.31	0.431	0.92	65.653	1093.023	92.3	10.7	0.031926292	15.3641	26.11	0.18	0.12247042	0.011824	99.99918187		3.94E-15	26.11	0.12247042	66.671098
9	1600	6	0.08	0.537	1.132	85.491	1332.103	98.7	13.9	0.03054777	15.3884	26.15	0.17	0.11328476	0.011314	99.99921719		5.13E-15	26.15	0.11328476	77.921445
10	1600	6	0.03	0.262	0.514	39.65	613.521	99.7	6.5	0.032135414	15.3700	26.12	0.17	0.11193277	0.011902	99.99917651		2.38E-15	26.12	0.11193277	79.815174
											Mean +/- s.d. =	26.08	0.05							WtdMean	1sd
											wtd mean =	**26.08**	0.14							26.075814	0.0367141
												26.02									

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

with 27.9
with 27.84
blnk corr beam errors

Crystal	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	%37err	%36err	%40err	WtdAge39Ar	K/Ca	37/39err	all xtals Age (Ma)
1	0.064432	0.4609	3.4867E-05	4.0596	0.0091	0.03	49.25	761.03	2.319	0.013	0.024	0.752	4.033	0.311	2.091354141	32.14853	0.8254	26.08
2	0.058385	0.4618	0.0003567	3.3386	0.0534	0.46	73.84	1259.12	0.21	0.033	0.021	0.478	3.307	0.311	3.127863512	29.141	0.5875	26.01
3	0.064723	0.4700	2.8661E-05	3.3574	0.0582	0.03	55.73	857.23	0.41	0.08	0.048	0.235	3.325	0.314	2.360137579	29.76262	0.4216	26.01
4	0.062039	0.4636	0.00016249	3.3784	0.0457	0.25	93.09	1493.88	0.557	0.04	0.038	0.707	3.347	0.312	3.949056012	29.86041	0.7856	26.05
5	0.0648	0.4667	2.4275E-05	3.3851	0.0168	0.02	39.52	607.28	0.597	0.07	0.028	1.267	3.354	0.311	1.67413484	30.43853	1.3139	26.01
6	0.057518	0.4610	0.00039379	3.3335	0.0281	0.62	89.39	1547.31	0.101	0.027	0.009	0.48	3.302	0.310	3.798036524	29.40852	0.5888	26.09
7	0.063133	0.4602	9.732E-05	3.6231	0.0056	0.10	62.11	979.54	1.423	0.001	0.008	0.006	3.594	0.310	2.642941159	28.96082	0.3401	26.13
8	0.060086	0.4615	0.00025837	3.6719	0.0080	0.29	65.65	1087.88	1.543	0.029	0.021	0.267	3.643	0.311	2.791476691	31.32215	0.4333	26.11
9	0.064145	0.4606	4.1475E-05	3.4140	0.0293	0.06	85.49	1326.96	0.744	0.003	0.022	0.927	3.383	0.311	3.640669723	32.73561	0.9874	26.15
10	0.064889	0.4601	8.0769E-06	3.5104	0.0023	0.01	39.65	608.38	1.105	0.002	0.003	1.367	3.480	0.310	1.686510032	31.11832	1.4086	26.12
						36c		**40c**					**%36err**	**%40err**				mean= 26.08
																		1s.d.= 0.05
																		2 s.d. +/-= 26.18
																		25.98

Henry-NBMG, NWRA 2652B, sanidine, J = 0.0009420 +/- 0.5%
4 amu discrimination = 1.01753 +/- 0.34%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

Crystal	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	1600	6	0.07	2.563	0.053	3.299	70.926	78.3	0.9	5.643265444	15.7276	26.53	0.19	0.14155326	2.087080	99.85559493	367.79	1.98E-16	26.53	0.14155326		
2	1600	6	1.83	0.617	1.437	84.884	1823.97	71.1	23.1	0.052723203	15.2935	25.81	0.19	0.14218491	0.019527	99.99864894		5.09E-15	25.81	0.14218491	49.464425	1276.429
3	1600	6	0.12	0.36	0.618	47.111	752.277	96.0	12.8	0.0554272	15.2905	25.80	0.17	0.11527359	0.020528	99.99857965		2.83E-15	25.80	0.11527359	75.25587	1941.601
4	1600	6	0.12	0.379	0.802	61.447	971.283	96.7	16.7	0.044738364	15.2989	25.81	0.17	0.1151952	0.016570	99.99885355		3.69E-15	25.81	0.1151952	75.358319	1945.3
5	1600	6	0.02	0.16	0.263	20.437	320.774	99.5	5.6	0.056786585	15.4278	26.03	0.18	0.1214289	0.021032	99.99854481		1.23E-15	26.03	0.1214289	67.819703	1765.347
6	1600	6	0.04	0.377	0.747	57.059	884.295	99.4	15.5	0.047924669	15.3789	25.95	0.17	0.11292268	0.017750	99.9987719		3.42E-15	25.95	0.11292268	78.421947	2034.893
7	1600	6	0.06	0.249	0.505	38.039	596.73	97.7	10.3	0.047480155	15.2613	25.75	0.17	0.11404451	0.017585	99.99878329		2.28E-15	25.75	0.11404451	76.886704	1979.91
8	1600	6	0.03	0.187	0.346	25.437	401.356	98.2	6.9	0.05332345	15.3687	25.93	0.18	0.11901925	0.019749	99.99863356		1.53E-15	25.93	0.11901925	70.593645	1830.564
9	1600	6	0.03	0.214	0.399	30.073	469.36	98.7	8.2	0.051615407	15.3168	25.84	0.17	0.11351736	0.019117	99.99867732		1.8E-15	25.84	0.11351736	77.602447	2005.558
											Mean +/- s.d. =	25.94	0.23							WtdMean	1sd	wJ
											Mean +/- s.d. =	25.87	0.09							25.8654567	0.0418339	0.135925
											wtd mean =	25.87	0.14	with 27.9		25.81	with 27.84					

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

blnk corr beam errors

Crystal	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	%37err	%36err	%40err	WtdAge39Ar	K/Ca	37/39err	all xtals Age (Ma)
1	0.049853	0.4530	0.00086514	7.0043	0.4150	0.06	3.30	65.89	0.056	0.087	0.06	0.022	6.990	0.286	0.237986536	0.1772	0.3516	25.81
2	0.046463	0.4438	0.00098119	7.0067	0.0332	1.82	84.88	1818.93	0.199	0.051	0.019	0.248	6.993	0.281	5.955658446	18.967	0.4239	25.80
3	0.062772	0.4423	0.00014204	7.1355	0.0132	0.11	47.11	747.24	1.364	0.03	0.027	0.962	7.122	0.281	3.304776639	18.0417	1.0208	25.81
4	0.063316	0.4478	0.00010985	7.1816	0.0210	0.11	61.45	966.24	1.587	0.06	0.052	0.029	7.168	0.285	4.31276777	22.3522	0.3468	26.03
5	0.064446	0.4527	4.3577E-05	7.7639	0.0026	0.01	20.44	315.73	3.35	0.1	0.03	0.19	7.751	0.282	1.446409935	17.6098	0.4021	25.95
6	0.064612	0.4425	2.7943E-05	7.0190	0.0460	0.03	57.06	879.26	0.46	0.03	0.03	1	7.005	0.282	4.025576911	20.8661	1.0566	25.75
7	0.064008	0.4414	8.9692E-05	7.0792	0.0137	0.05	38.04	591.69	1.03	0.02	0.02	0.23	7.065	0.281	2.663319527	21.0614	0.4110	25.93
8	0.063904	0.4534	5.9514E-05	7.1756	0.0095	0.02	25.44	396.32	1.56	0.1	0.04	0.21	7.162	0.283	1.793433337	18.7535	0.4119	25.84
9	0.064485	0.4416	4.0215E-05	7.0681	0.0299	0.02	30.07	464.32	0.95	0.01	0.03	0.01	7.054	0.282	2.11318038	19.3741	0.3403	25.84
						36c		40c					%36err	%40err				mean= 25.865
						0.017		5.114					0.003	0.308				1s.d.= 0.088
																		2 s.d. +/-= 26.042
																		25.689

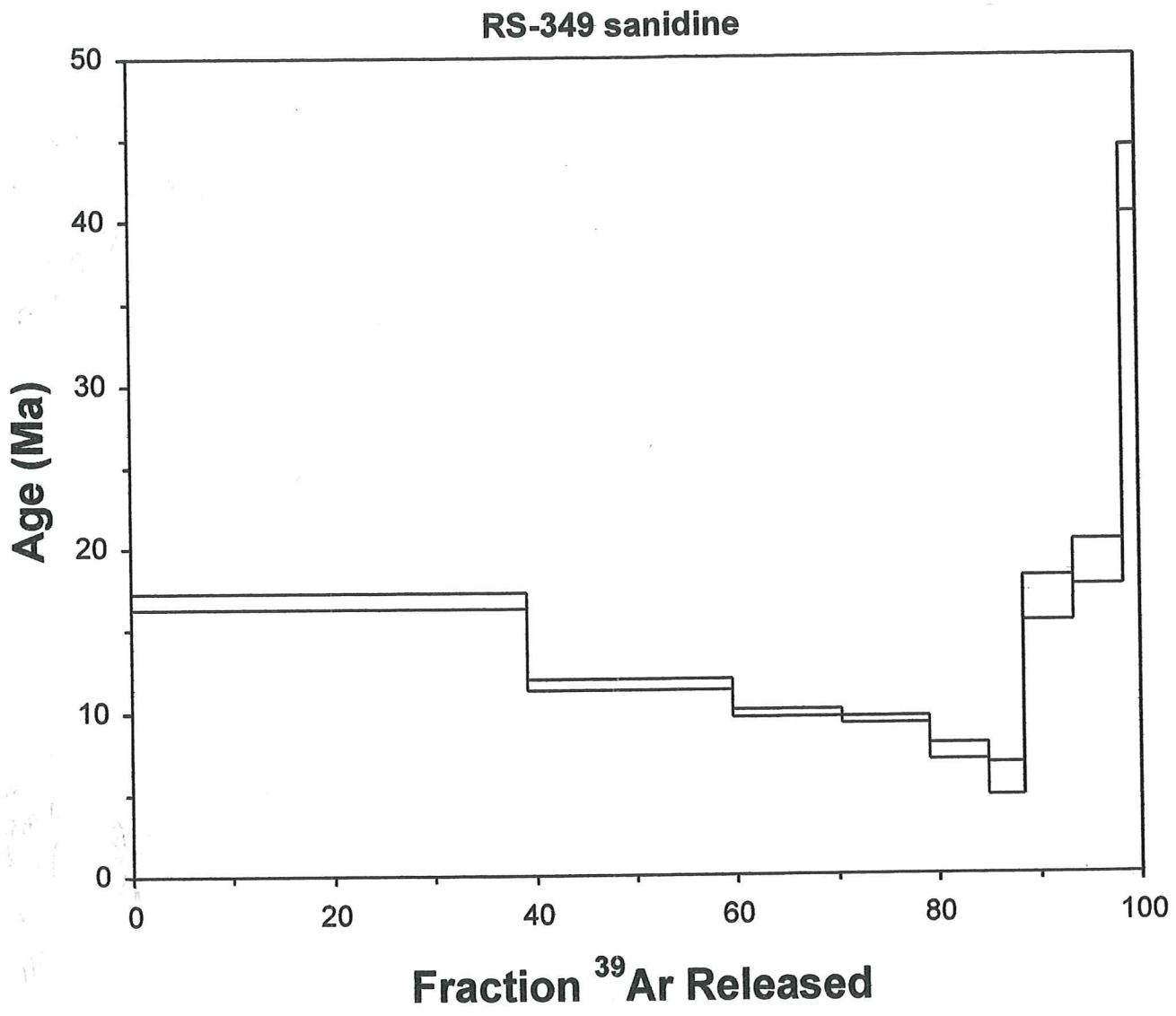
Henry - NBMG, RS-349 sanidine, 5.16 mg, J = 0.0009514+/- 0.5%
4 amu discrimination = 1.01629 +/- 0.16%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

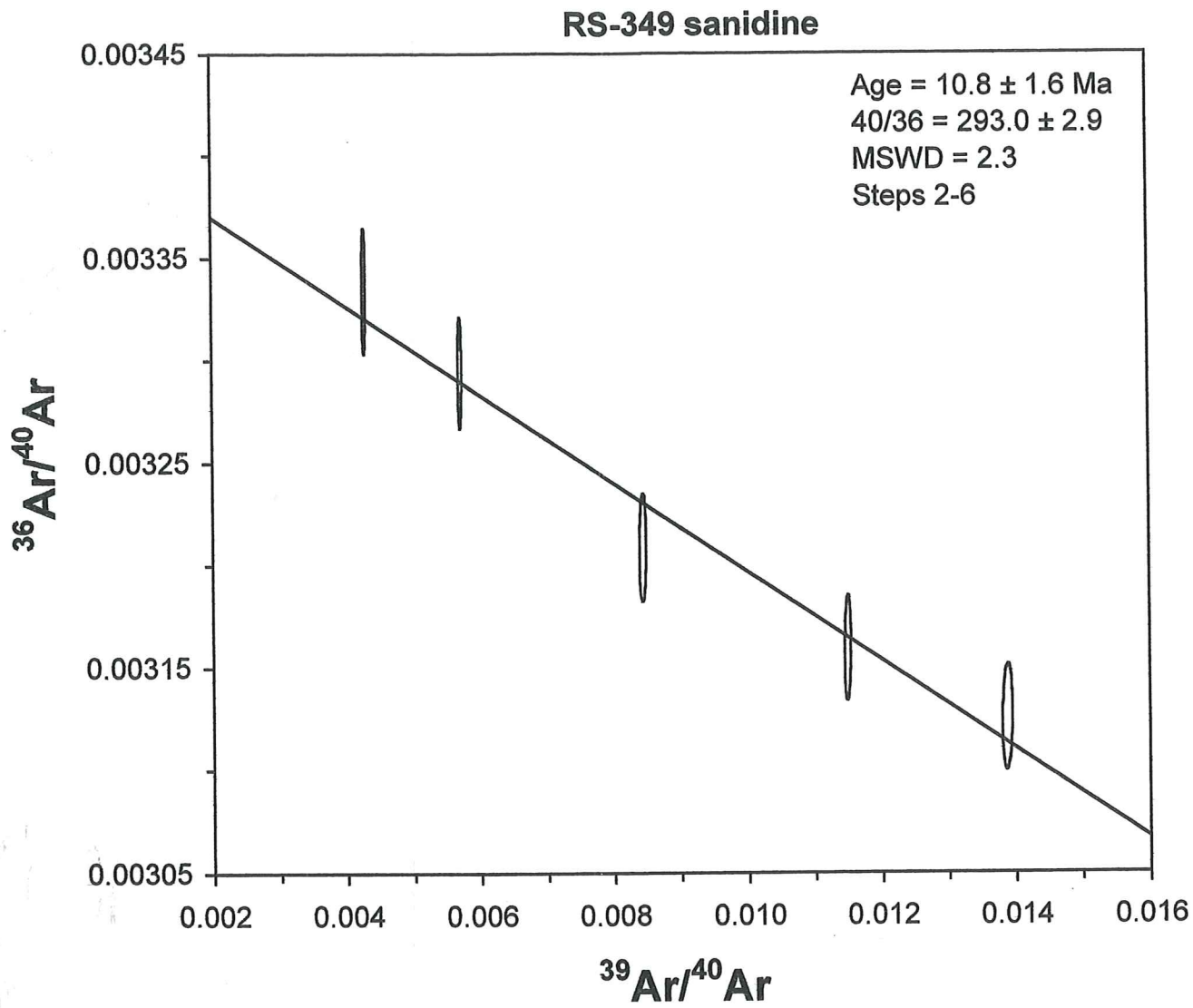
step	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	700	12	13.657	11.202	2.896	24.41	4206.377	5.7	39.3	5.127535918	9.7972	16.74	0.52	0.5081545	2.225930	99.84598791	62.17	1.46E-15	16.74	0.508154	3.8727	64.82045
2	800	12	4.983	21.576	1.119	12.607	1525.495	5.7	20.3	19.20314396	6.7983	11.63	0.35	0.3420921	8.301238	99.42563732		7.56E-16	11.63	0.342092	8.545	99.38732
3	900	12	2.012	1.056	0.469	6.76	623.94	6.6	10.9	1.74363872	5.7521	9.85	0.25	0.2420442	0.757706	99.9475743		4.06E-16	9.85	0.242044	17.069	168.0623
4	1000	12	1.367	0.491	0.337	5.423	427.364	7.6	8.7	1.010381561	5.4692	9.36	0.22	0.2149613	0.439163	99.96961432		3.25E-16	9.36	0.214961	21.641	202.6257
5	1075	12	2.217	0.843	0.452	3.572	661.175	2.5	5.7	2.634946349	4.3395	7.43	0.51	0.508644	1.144721	99.92079672		2.14E-16	7.43	0.508644	3.8652	28.73004
6	1130	12	1.9	0.569	0.393	2.244	560.247	1.4	3.6	2.831200884	3.3478	5.74	0.98	0.981581	1.229909	99.91490257		1.35E-16	5.74	0.981581	1.0379	5.954326
7	1200	12	3.052	0.375	0.599	3.042	916.446	3.4	4.9	1.375825356	9.8013	16.75	1.36	1.3574204	0.597937	99.95862871		1.83E-16	16.75	1.35742	0.5427	9.087751
8	1275	12	4.931	0.266	0.98	3.158	1468.845	2.5	5.1	0.939948017	11.1088	18.97	1.42	1.4208386	0.408558	99.9717319		1.89E-16	18.97	1.420839	0.4953	9.395268
9	1400	12	2.572	0.107	0.506	0.957	774.992	3.3	1.5	1.247803996	25.0354	42.47	2.04	2.0289194	0.542320	99.96247689		5.74E-17	42.47	2.028919	0.2429	10.31625
											Total gas age =	13.89	0.27							WtdMean	1sd	wJ
																				10.44074	0.1321	0.269293

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

Cumulative %39Ar rlsd = 100.0

step	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	blnk corr beam errors %36err	%40err	WtdAge39Ar			
1	0.00583	0.1643	0.0031913	0.3400	0.0632	13.53	24.41	4168.23	0.07	0.02	0.01	0.298	0.032	6.571575764	1	15.72169	17.75431
2	0.00844	0.2445	0.0032086	0.3353	0.1162	4.85	12.607	1487.35	0.03	0.18	0.03	0.292	0.042	2.358451691	2	10.94682	12.31518
3	0.01149	0.1658	0.0031594	0.3329	0.2236	1.88	6.76	585.79	0.01	0.03	0.01	0.290	0.032	1.070544449	3	9.361912	10.33009
4	0.01388	0.2184	0.0031254	0.3373	0.1943	1.24	5.423	389.21	0.04	0.14	0.04	0.293	0.050	0.816681662	4	8.933077	9.792923
5	0.00571	0.1817	0.0032941	0.3365	0.0243	2.09	3.572	623.03	0.05	0.08	0.01	0.294	0.032	0.427045116	5	6.415712	8.450288
6	0.00428	0.2387	0.0033338	0.3756	0.0525	1.77	2.244	522.10	0.17	0.17	0.04	0.336	0.050	0.20706461	6	3.773838	7.700162
7	0.00348	0.1975	0.0032684	0.3992	0.0162	2.89	3.042	870.13	0.22	0.11	0.02	0.364	0.036	0.819299213	7	14.03016	19.45984
8	0.00221	0.1658	0.0032982	0.3447	0.0349	4.77	3.158	1422.53	0.09	0.03	0.01	0.304	0.032	0.963405112	8	16.12532	21.80868
9	0.00134	0.6321	0.0032681	0.3345	0.0409	2.37	0.957	713.74	0.02	0.61	0.03	0.291	0.042	0.65367473	9	38.40916	46.52484


RS-349 sanidine
Age (Ma)
50
40
30
20
10
0
0
20
40
60
80
100
Fraction 39Ar Released


RS-349 sanidine
Age = 10.8 ± 1.6 Ma
40/36 = 293.0 ± 2.9
MSWD = 2.3
Steps 2-6
0.00345
0.00335
0.00325
0.00315
0.00305
36Ar/40Ar
0.002
0.004
0.006
0.008
0.010
0.012
0.014
0.016
39Ar/40Ar

Henry-NBMG, RS349, sanidine, J = 0.0009514 +/- 0.5%
4 amu discrimination = 1.01753 +/- 0.34%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

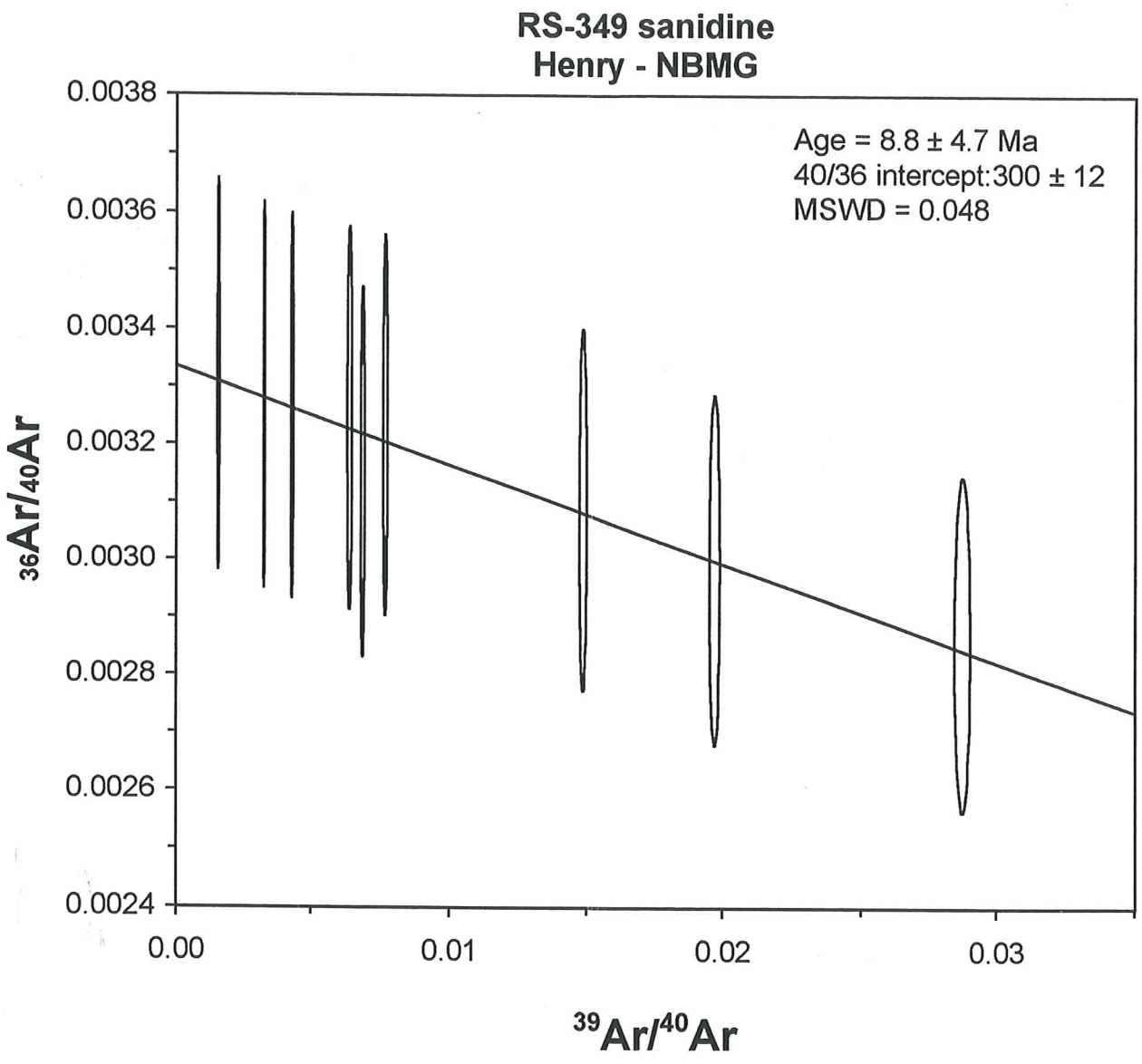
Crystal	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	1600	6	2.051	8.917	0.426	2.639	616.39	3.8	6.7	15.86870506	8.9860	15.36	1.89	1.8874386	6.866657	99.52489597	39.48	1.58E-16	15.36	1.88743855	0.2807077	4.311109
2	1600	6	1.999	1.73	0.5	9.407	635.325	8.9	23.8	0.859807284	5.9671	10.21	0.43	0.4239356	0.373733	99.97414144		5.64E-16	10.21	0.42393557	5.5641687	56.82686
3	1600	6	2.38	2.194	0.454	1.081	703.754	2.0	2.7	9.513622737	13.0087	22.19	3.96	3.9554441	4.124553	99.71462215		6.49E-17				
4	1600	6	1.104	4.094	0.242	2.111	333.532	4.0	5.3	9.089486389	6.2513	10.70	1.37	1.3709569	3.941174	99.72731017		1.27E-16	10.70	1.3709569	0.5320499	5.69187
5	1600	6	1.263	0.135	0.253	1.214	377.147	2.6	3.1	0.51984855	8.0422	13.75	1.84	1.838715	0.225986	99.98436404		7.28E-17	13.75	1.83871497	0.2957816	4.067293
6	1600	6	1.724	5.342	0.525	16.947	591.989	15.6	42.9	1.473999816	5.4347	9.30	0.25	0.2425797	0.640585	99.95567789		1.02E-15	9.30	0.24257966	16.993829	158.1106
7	1600	6	0.257	0.09	0.072	1.547	83.262	10.0	3.9	0.271945306	5.0892	8.71	0.51	0.51215	0.118227	99.99181984		9.28E-17	8.71	0.51215003	3.8124626	33.2218
8	1600	6	1.004	1.166	0.214	2.312	304.349	4.7	5.9	2.358916896	6.1271	10.49	0.91	0.90348	1.024889	99.92908795		1.39E-16	10.49	0.90347999	1.2250757	12.84614
9	1600	6	1.051	0.205	0.216	2.22	326.57	7.0	5.6	0.431669261	10.1636	17.36	1.10	1.099579	0.187658	99.98701595		1.33E-16	17.36	1.09957896	0.8270793	14.35892
											Mean +/- s.d. =	13.12	4.48							WtdMean	1sd	wJ
											Mean +/- s.d. =	11.99	2.92							9.80099096	0.1840178	0.190431
											wtd mean =	9.80	0.19	with 27.9								
												9.78		with 27.84								

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

blnk corr beam errors

Crystal	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	%37err	%36err	%40err	WtdAge39Ar	K/Ca	37/39err
1	0.004299	0.4483	0.00326551	4.1697	0.0566	2.03	2.64	611.24	0.31	0.22	0.06	0.06	4.151	0.191	1.026589716	0.06302	0.4099
2	0.014863	0.3897	0.00308629	4.1587	0.3436	1.98	9.41	630.18	0.08	0.05	0.04	0.23	4.141	0.185	2.433477482	1.16305	0.4113
3	0.001541	0.9572	0.00331997	4.1579	0.0301	2.36	1.08	698.60	0.01	0.876	0.03	0.25	4.140	0.182	0.607610714	0.10511	0.9711
4	0.0064	0.5537	0.00324416	4.1756	0.0067	1.08	2.11	328.38	0.38	0.40	0.03	0.06	4.158	0.183	0.572023252	0.11002	0.5260
5	0.003249	0.3876	0.00328386	4.1582	0.8135	1.24	1.21	372.00	0.03	0.02	0.05	2.69	4.140	0.186	0.422839767	1.92364	2.7114
6	0.028753	0.4145	0.00285367	4.1647	0.3900	1.70	16.95	586.84	0.21	0.10	0.12	0.07	4.145	0.216	3.993791489	0.67843	0.3604
7	0.019719	0.3884	0.00298183	4.1751	0.0126	0.24	1.55	78.11	0.38	0.05	0.02	0.14	4.157	0.181	0.341452837	3.67721	0.3694
8	0.007694	0.4054	0.00323212	4.1633	0.3032	0.98	2.31	299.20	0.19	0.09	0.09	0.07	4.144	0.202	0.614073759	0.42392	0.3582
9	0.006877	0.4151	0.00315238	4.1679	0.2084	1.03	2.22	321.42	0.27	0.12	0.10	0.27	4.149	0.204	0.976226444	2.31659	0.4486

1	19.13	11.58
2	11.06	9.37
3	30.10	14.28
4	13.44	7.96
5	17.43	10.07
6	9.79	8.82
7	9.74	7.69
8	12.29	8.68
9	19.56	15.16


RS-349 sanidine
Henry - NBMG
Age = 8.8 ± 4.7 Ma
40/36 intercept:300 ± 12
MSWD = 0.048
0.0038
0.0036
0.0034
0.0032
0.0030
0.0028
0.0026
0.0024
36Ar/40Ar
0.00
0.01
0.02
0.03
39Ar/40Ar

Henry-NBMG, NWRA 2651, sanidine, J = 0.0009488 +/- 0.5%
4 amu discrimination = 1.01753 +/- 0.34%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

Crystal	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor
1	1600	6	0.05	0.315	0.648	49.249	766.167	98.9	8.0	0.031105617	15.3445	26.08	0.17	0.1137104	0.011521	99.9992029	614.06	2.95E-15	26.08	0.1137104	77.339188
2	1600	6	0.48	0.521	1.074	73.836	1264.262	89.4	12.0	0.034315917	15.3072	26.01	0.18	0.12005039	0.012709	99.99912063		4.43E-15	26.01	0.12005039	69.386161
3	1600	6	0.05	0.385	0.728	55.726	862.372	99.1	9.1	0.033599191	15.3036	26.01	0.17	0.11410477	0.012444	99.999139		3.34E-15	26.01	0.11410477	76.805513
4	1600	6	0.27	0.641	1.284	93.085	1499.022	95.1	15.2	0.033489162	15.3297	26.05	0.18	0.11687016	0.012403	99.99914182		5.59E-15	26.05	0.11687016	73.213758
5	1600	6	0.04	0.267	0.513	39.524	612.422	99.2	6.4	0.032853092	15.3054	26.01	0.17	0.11408767	0.012168	99.99915812		2.37E-15	26.01	0.11408767	76.828534
6	1600	6	0.64	0.625	1.282	89.388	1552.452	88.3	14.6	0.03400375	15.3534	26.09	0.18	0.12110117	0.012594	99.99912863		5.36E-15	26.09	0.12110117	68.187275
7	1600	6	0.12	0.441	0.846	62.112	984.679	97.1	10.1	0.034529409	15.3759	26.13	0.17	0.11492556	0.012789	99.99911516		3.73E-15	26.13	0.11492556	75.712355
8	1600	6	0.31	0.431	0.92	65.653	1093.023	92.3	10.7	0.031926292	15.3641	26.11	0.18	0.12247042	0.011824	99.99918187		3.94E-15	26.11	0.12247042	66.671098
9	1600	6	0.08	0.537	1.132	85.491	1332.103	98.7	13.9	0.03054777	15.3884	26.15	0.17	0.11328476	0.011314	99.99921719		5.13E-15	26.15	0.11328476	77.921445
10	1600	6	0.03	0.262	0.514	39.65	613.521	99.7	6.5	0.032135414	15.3700	26.12	0.17	0.11193277	0.011902	99.99917651		2.38E-15	26.12	0.11193277	79.815174
											Mean +/- s.d. =	26.08	0.05							WtdMean	1sd
											wtd mean =	**26.08**	0.14	with 27.9						26.075814	0.0367141
												26.02		with 27.84							

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

blnk corr beam errors

Crystal	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	%37err	%36err	%40err	WtdAge39Ar	K/Ca	37/39err
1	0.064432	0.4609	3.4867E-05	4.0596	0.0091	0.03	49.25	761.03	2.319	0.013	0.024	0.752	4.033	0.311	2.091354141	32.14853	0.8254
2	0.058385	0.4618	0.0003567	3.3386	0.0534	0.46	73.84	1259.12	0.21	0.033	0.021	0.478	3.307	0.311	3.127863512	29.141	0.5875
3	0.064723	0.4700	2.8661E-05	3.3574	0.0582	0.03	55.73	857.23	0.41	0.08	0.048	0.235	3.325	0.314	2.360137579	29.76262	0.4216
4	0.062039	0.4636	0.00016249	3.3784	0.0457	0.25	93.09	1493.88	0.557	0.04	0.038	0.707	3.347	0.312	3.949056012	29.86041	0.7856
5	0.0648	0.4667	2.4275E-05	3.3851	0.0168	0.02	39.52	607.28	0.597	0.07	0.028	1.267	3.354	0.311	1.67413484	30.43853	1.3139
6	0.057518	0.4610	0.00039379	3.3335	0.0281	0.62	89.39	1547.31	0.101	0.027	0.009	0.48	3.302	0.310	3.798036524	29.40852	0.5888
7	0.063133	0.4602	9.732E-05	3.6231	0.0056	0.10	62.11	979.54	1.423	0.001	0.008	0.006	3.594	0.310	2.642941159	28.96082	0.3401
8	0.060086	0.4615	0.00025837	3.6719	0.0080	0.29	65.65	1087.88	1.543	0.029	0.021	0.267	3.643	0.311	2.791476691	31.32215	0.4333
9	0.064145	0.4606	4.1475E-05	3.4140	0.0293	0.06	85.49	1326.96	0.744	0.003	0.022	0.927	3.383	0.311	3.640669723	32.73561	0.9874
10	0.064889	0.4601	8.0769E-06	3.5104	0.0023	0.01	39.65	608.38	1.105	0.002	0.003	1.367	3.480	0.310	1.686510032	31.11832	1.4086
						36c		**40c**					**%36err**	**%40err**			

	all xtals Age (Ma)
	26.08
	26.01
	26.01
	26.05
	26.01
	26.09
	26.13
	26.11
	26.15
	26.12
mean=	26.08
1s.d.=	0.05
2 s.d. +/-=	26.18
	25.98

Henry-NBMG, NWRA 2652B, sanidine, J = 0.0009420 +/- 0.5%
4 amu discrimination = 1.01753 +/- 0.34%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

Crystal	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	1600	6	0.07	2.563	0.053	3.299	70.926	78.3	0.9	5.643265444	15.7276	26.53	0.19	0.14155326	2.087080	99.85559493	367.79	1.98E-16	26.53	0.14155326		
2	1600	6	1.83	0.617	1.437	84.884	1823.97	71.1	23.1	0.052723203	15.2935	25.81	0.19	0.14218491	0.019527	99.99864894		5.09E-15	25.81	0.14218491	49.464425	1276.429
3	1600	6	0.12	0.36	0.618	47.111	752.277	96.0	12.8	0.0554272	15.2905	25.80	0.17	0.11527359	0.020528	99.99857965		2.83E-15	25.80	0.11527359	75.25587	1941.601
4	1600	6	0.12	0.379	0.802	61.447	971.283	96.7	16.7	0.044738364	15.2989	25.81	0.17	0.1151952	0.016570	99.99885355		3.69E-15	25.81	0.1151952	75.358319	1945.3
5	1600	6	0.02	0.16	0.263	20.437	320.774	99.5	5.6	0.056786585	15.4278	26.03	0.18	0.1214289	0.021032	99.99854481		1.23E-15	26.03	0.1214289	67.819703	1765.347
6	1600	6	0.04	0.377	0.747	57.059	884.295	99.4	15.5	0.047924669	15.3789	25.95	0.17	0.11292268	0.017750	99.9987719		3.42E-15	25.95	0.11292268	78.421947	2034.893
7	1600	6	0.06	0.249	0.505	38.039	596.73	97.7	10.3	0.047480155	15.2613	25.75	0.17	0.11404451	0.017585	99.99878329		2.28E-15	25.75	0.11404451	76.886704	1979.91
8	1600	6	0.03	0.187	0.346	25.437	401.356	98.2	6.9	0.05332345	15.3687	25.93	0.18	0.11901925	0.019749	99.99863356		1.53E-15	25.93	0.11901925	70.593645	1830.564
9	1600	6	0.03	0.214	0.399	30.073	469.36	98.7	8.2	0.051615407	15.3168	25.84	0.17	0.11351736	0.019117	99.99867732		1.8E-15	25.84	0.11351736	77.602447	2005.558
											Mean +/- s.d. =	25.94	0.23							WtdMean	1sd	wJ
											Mean +/- s.d. =	25.87	0.09							25.8654567	0.0418339	0.135925
											wtd mean =	25.87	0.14	with 27.9		25.81	with 27.84					

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

blnk corr beam errors

Crystal	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	%37err	%36err	%40err	WtdAge39Ar	K/Ca	37/39err	all xtals Age (Ma)
1	0.049853	0.4530	0.00086514	7.0043	0.4150	0.06	3.30	65.89	0.056	0.087	0.06	0.022	6.990	0.286	0.237986536	0.1772	0.3516	
2	0.046463	0.4438	0.00098119	7.0067	0.0332	1.82	84.88	1818.93	0.199	0.051	0.019	0.248	6.993	0.281	5.955658446	18.967	0.4239	
3	0.062772	0.4423	0.00014204	7.1355	0.0132	0.11	47.11	747.24	1.364	0.03	0.027	0.962	7.122	0.281	3.304776639	18.0417	1.0208	25.81
4	0.063316	0.4478	0.00010985	7.1816	0.0210	0.11	61.45	966.24	1.587	0.06	0.052	0.029	7.168	0.285	4.31276777	22.3522	0.3468	25.80
5	0.064446	0.4527	4.3577E-05	7.7639	0.0026	0.01	20.44	315.73	3.35	0.1	0.03	0.19	7.751	0.282	1.446409935	17.6098	0.4021	25.81
6	0.064612	0.4425	2.7943E-05	7.0190	0.0460	0.03	57.06	879.26	0.46	0.03	0.03	1	7.005	0.282	4.025576911	20.8661	1.0566	26.03
7	0.064008	0.4414	8.9692E-05	7.0792	0.0137	0.05	38.04	591.69	1.03	0.02	0.02	0.23	7.065	0.281	2.663319527	21.0614	0.4110	25.95
8	0.063904	0.4534	5.9514E-05	7.1756	0.0095	0.02	25.44	396.32	1.56	0.1	0.04	0.21	7.162	0.283	1.793433337	18.7535	0.4119	25.75
9	0.064485	0.4416	4.0215E-05	7.0681	0.0299	0.02	30.07	464.32	0.95	0.01	0.03	0.01	7.054	0.282	2.11318038	19.3741	0.3403	25.84
						36c		40c					%36err	%40err				mean= 25.865
						0.017		5.114					0.003	0.308				1s.d.= 0.088
																		2 s.d. +/-= 26.042
																		25.689

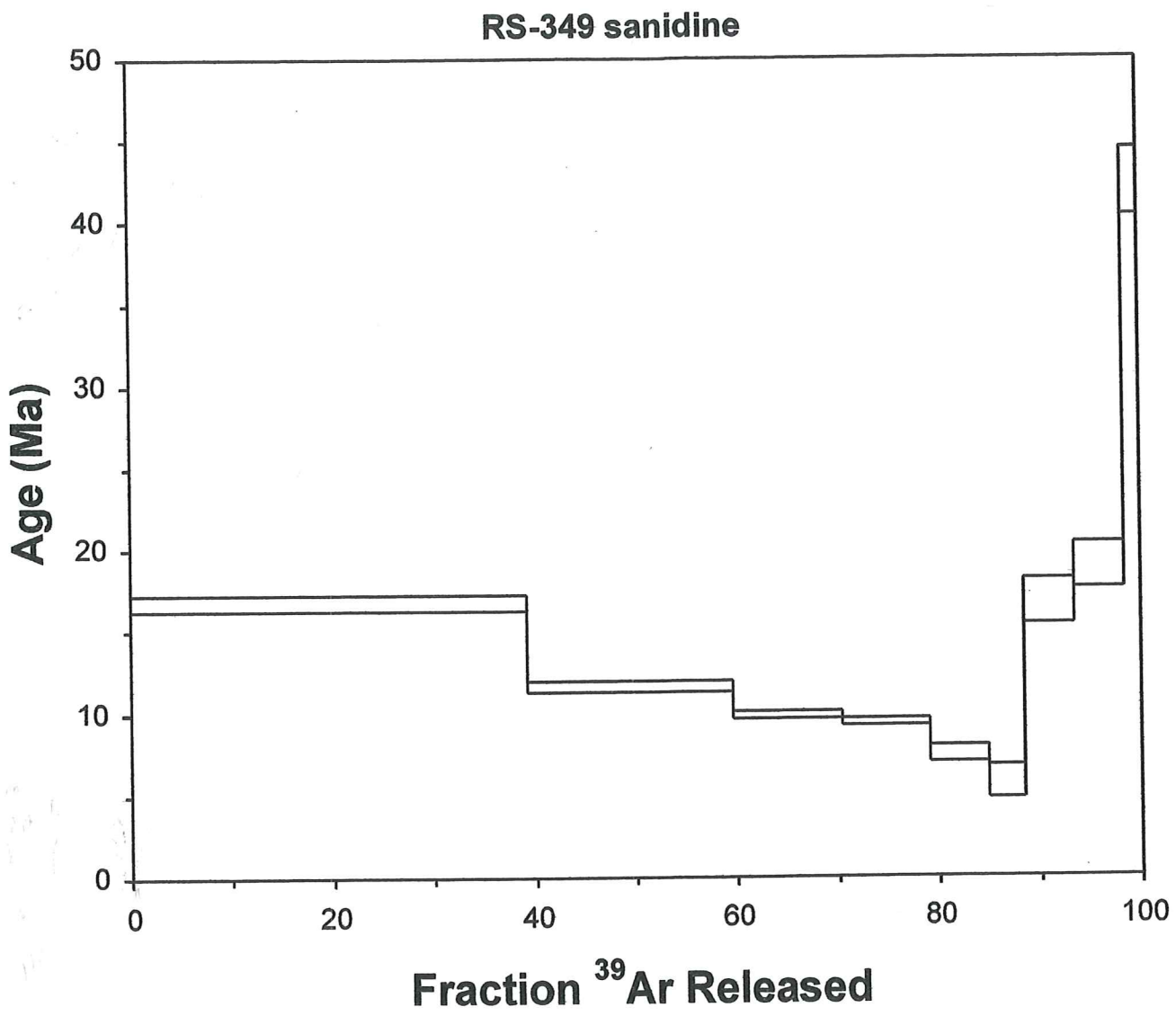
Henry - NBMG, RS-349 sanidine, 5.16 mg, J = 0.0009514+/- 0.5%
4 amu discrimination = 1.01629 +/- 0.16%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

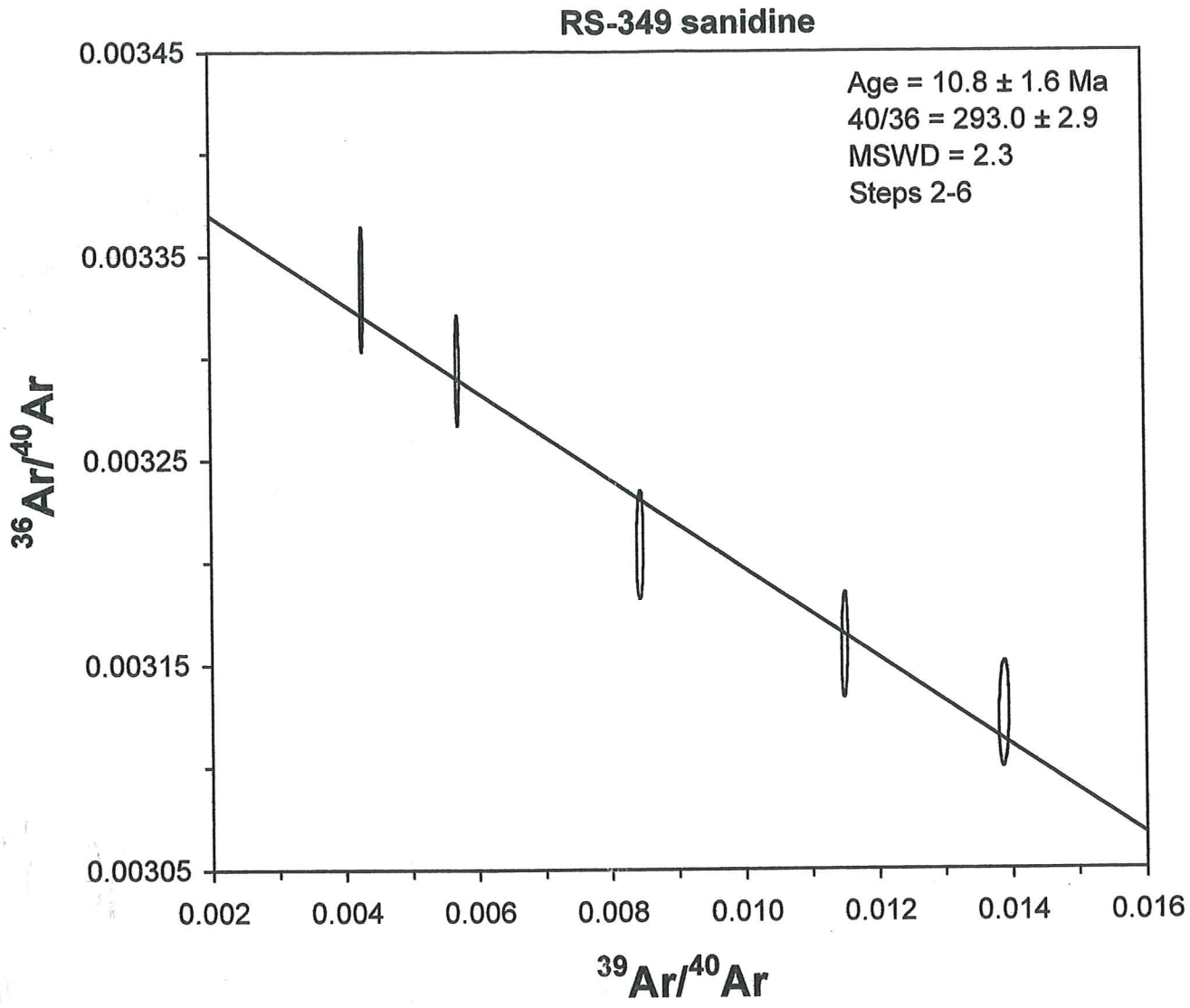
step	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	700	12	13.657	11.202	2.896	24.41	4206.377	5.7	39.3	5.127535918	9.7972	16.74	0.52	0.5081545	2.225930	99.84598791	62.17	1.46E-15	16.74	0.508154	3.8727	64.82045
2	800	12	4.983	21.576	1.119	12.607	1525.495	5.7	20.3	19.20314396	6.7983	11.63	0.35	0.3420921	8.301238	99.42563732		7.56E-16	11.63	0.342092	8.545	99.38732
3	900	12	2.012	1.056	0.469	6.76	623.94	6.6	10.9	1.74363872	5.7521	9.85	0.25	0.2420442	0.757706	99.9475743		4.06E-16	9.85	0.242044	17.069	168.0623
4	1000	12	1.367	0.491	0.337	5.423	427.364	7.6	8.7	1.010381561	5.4692	9.36	0.22	0.2149613	0.439163	99.96961432		3.25E-16	9.36	0.214961	21.641	202.6257
5	1075	12	2.217	0.843	0.452	3.572	661.175	2.5	5.7	2.634946349	4.3395	7.43	0.51	0.508644	1.144721	99.92079672		2.14E-16	7.43	0.508644	3.8652	28.73004
6	1130	12	1.9	0.569	0.393	2.244	560.247	1.4	3.6	2.831200884	3.3478	5.74	0.98	0.981581	1.229909	99.91490257		1.35E-16	5.74	0.981581	1.0379	5.954326
7	1200	12	3.052	0.375	0.599	3.042	916.446	3.4	4.9	1.375825356	9.8013	16.75	1.36	1.3574204	0.597937	99.95862871		1.83E-16	16.75	1.35742	0.5427	9.087751
8	1275	12	4.931	0.266	0.98	3.158	1468.845	2.5	5.1	0.939948017	11.1088	18.97	1.42	1.4208386	0.408558	99.9717319		1.89E-16	18.97	1.420839	0.4953	9.395268
9	1400	12	2.572	0.107	0.506	0.957	774.992	3.3	1.5	1.247803996	25.0354	42.47	2.04	2.0289194	0.542320	99.96247689		5.74E-17	42.47	2.028919	0.2429	10.31625
											Total gas age =	13.89	0.27							WtdMean	1sd	wJ
																				10.44074	0.1321	0.269293

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

Cumulative %39Ar rlsd = 100.0

step	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	blnk corr beam errors %36err	%40err	WtdAge39Ar			
1	0.00583	0.1643	0.0031913	0.3400	0.0632	13.53	24.41	4168.23	0.07	0.02	0.01	0.298	0.032	6.571575764	1	15.72169	17.75431
2	0.00844	0.2445	0.0032086	0.3353	0.1162	4.85	12.607	1487.35	0.03	0.18	0.03	0.292	0.042	2.358451691	2	10.94682	12.31518
3	0.01149	0.1658	0.0031594	0.3329	0.2236	1.88	6.76	585.79	0.01	0.03	0.01	0.290	0.032	1.070544449	3	9.361912	10.33009
4	0.01388	0.2184	0.0031254	0.3373	0.1943	1.24	5.423	389.21	0.04	0.14	0.04	0.293	0.050	0.816681662	4	8.933077	9.792923
5	0.00571	0.1817	0.0032941	0.3365	0.0243	2.09	3.572	623.03	0.05	0.08	0.01	0.294	0.032	0.427045116	5	6.415712	8.450288
6	0.00428	0.2387	0.0033338	0.3756	0.0525	1.77	2.244	522.10	0.17	0.17	0.04	0.336	0.050	0.20706461	6	3.773838	7.700162
7	0.00348	0.1975	0.0032684	0.3992	0.0162	2.89	3.042	870.13	0.22	0.11	0.02	0.364	0.036	0.819299213	7	14.03016	19.45984
8	0.00221	0.1658	0.0032982	0.3447	0.0349	4.77	3.158	1422.53	0.09	0.03	0.01	0.304	0.032	0.963405112	8	16.12532	21.80868
9	0.00134	0.6321	0.0032681	0.3345	0.0409	2.37	0.957	713.74	0.02	0.61	0.03	0.291	0.042	0.65367473	9	38.40916	46.52484


RS-349 sanidine
Age (Ma)
50
40
30
20
10
0
0
20
40
60
80
100
Fraction 39Ar Released


RS-349 sanidine
Age = 10.8 ± 1.6 Ma
40/36 = 293.0 ± 2.9
MSWD = 2.3
Steps 2-6
0.00345
0.00335
0.00325
0.00315
0.00305
36Ar/40Ar
0.002
0.004
0.006
0.008
0.010
0.012
0.014
0.016
39Ar/40Ar

Henry-NBMG, RS349, sanidine, J = 0.0009514 +/- 0.5%
4 amu discrimination = 1.01753 +/- 0.34%, 40/39K = 0.01207 +/- 83.0%, 36/37Ca = 0.0002723 +/- 4.28%, 39/37Ca = 0.0006968 +/- 1.73%

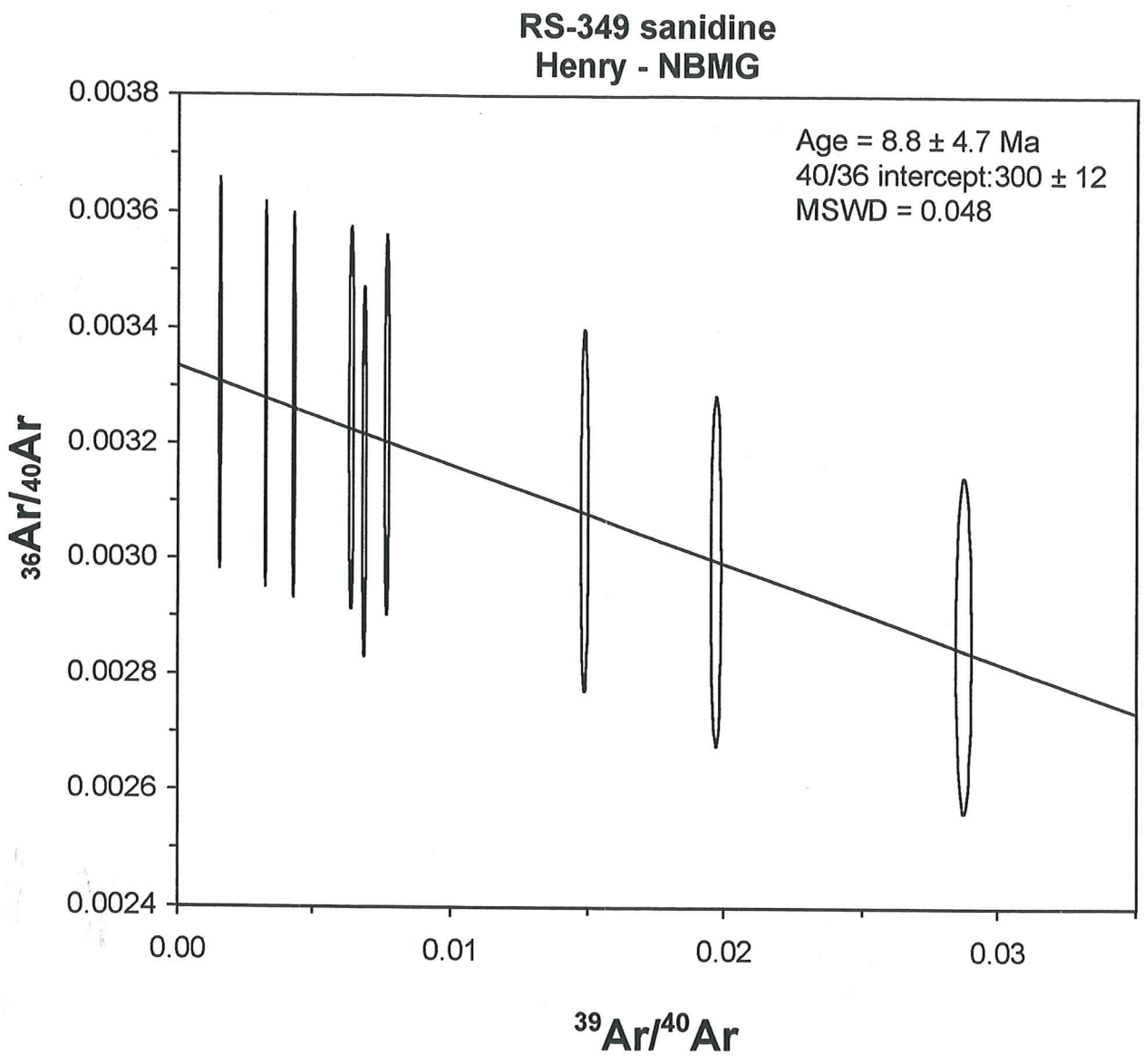
Crystal	T (C)	t (min.)	36Ar	37Ar	38Ar	39Ar	40Ar	%40Ar*	% 39Ar rlsd	Ca/K	40Ar*/39ArK	Age (Ma)	1s.d.	anal err	37/39c	%39ArK	total39	mol 39Ar	Wmdata	WMs	wfactor	WxX
1	1600	6	2.051	8.917	0.426	2.639	616.39	3.8	6.7	15.86870506	8.9860	15.36	1.89	1.8874386	6.866657	99.52489597	39.48	1.58E-16	15.36	1.88743855	0.2807077	4.311109
2	1600	6	1.999	1.73	0.5	9.407	635.325	8.9	23.8	0.859807284	5.9671	10.21	0.43	0.4239356	0.373733	99.97414144		5.64E-16	10.21	0.42393557	5.5641687	56.82686
3	1600	6	2.38	2.194	0.454	1.081	703.754	2.0	2.7	9.513622737	13.0087	22.19	3.96	3.9554441	4.124553	99.71462215		6.49E-17				
4	1600	6	1.104	4.094	0.242	2.111	333.532	4.0	5.3	9.089486389	6.2513	10.70	1.37	1.3709569	3.941174	99.72731017		1.27E-16	10.70	1.3709569	0.5320499	5.69187
5	1600	6	1.263	0.135	0.253	1.214	377.147	2.6	3.1	0.51984855	8.0422	13.75	1.84	1.838715	0.225986	99.98436404		7.28E-17	13.75	1.83871497	0.2957816	4.067293
6	1600	6	1.724	5.342	0.525	16.947	591.989	15.6	42.9	1.473999816	5.4347	9.30	0.25	0.2425797	0.640585	99.95567789		1.02E-15	9.30	0.24257966	16.993829	158.1106
7	1600	6	0.257	0.09	0.072	1.547	83.262	10.0	3.9	0.271945306	5.0892	8.71	0.51	0.51215	0.118227	99.99181984		9.28E-17	8.71	0.51215003	3.8124626	33.2218
8	1600	6	1.004	1.166	0.214	2.312	304.349	4.7	5.9	2.358916896	6.1271	10.49	0.91	0.90348	1.024889	99.92908795		1.39E-16	10.49	0.90347999	1.2250757	12.84614
9	1600	6	1.051	0.205	0.216	2.22	326.57	7.0	5.6	0.431669261	10.1636	17.36	1.10	1.099579	0.187658	99.98701595		1.33E-16	17.36	1.09957896	0.8270793	14.35892
											Mean +/- s.d. =	13.12	4.48							WtdMean	1sd	wJ
											Mean +/- s.d. =	11.99	2.92							9.80099096	0.1840178	0.190431
											wtd mean =	9.80	0.19	with 27.9								
												9.78		with 27.84								

note: isotope beams in mV rlsd = released, error in age includes 0.5% J error, all errors 1 sigma
(Not corrected for decay)

blnk corr beam errors

Crystal	39/40c	39/40err	36/40c	36/40err	R2	36c	39c	40c	%36err	%39err	%40err	%37err	%36err	%40err	WtdAge39Ar	K/Ca	37/39err
1	0.004299	0.4483	0.00326551	4.1697	0.0566	2.03	2.64	611.24	0.31	0.22	0.06	0.06	4.151	0.191	1.026589716	0.06302	0.4099
2	0.014863	0.3897	0.00308629	4.1587	0.3436	1.98	9.41	630.18	0.08	0.05	0.04	0.23	4.141	0.185	2.433477482	1.16305	0.4113
3	0.001541	0.9572	0.00331997	4.1579	0.0301	2.36	1.08	698.60	0.01	0.876	0.03	0.25	4.140	0.182	0.607610714	0.10511	0.9711
4	0.0064	0.5537	0.00324416	4.1756	0.0067	1.08	2.11	328.38	0.38	0.40	0.03	0.06	4.158	0.183	0.572023252	0.11002	0.5260
5	0.003249	0.3876	0.00328386	4.1582	0.8135	1.24	1.21	372.00	0.03	0.02	0.05	2.69	4.140	0.186	0.422839767	1.92364	2.7114
6	0.028753	0.4145	0.00285367	4.1647	0.3900	1.70	16.95	586.84	0.21	0.10	0.12	0.07	4.145	0.216	3.993791489	0.67843	0.3604
7	0.019719	0.3884	0.00298183	4.1751	0.0126	0.24	1.55	78.11	0.38	0.05	0.02	0.14	4.157	0.181	0.341452837	3.67721	0.3694
8	0.007694	0.4054	0.00323212	4.1633	0.3032	0.98	2.31	299.20	0.19	0.09	0.09	0.07	4.144	0.202	0.614073759	0.42392	0.3582
9	0.006877	0.4151	0.00315238	4.1679	0.2084	1.03	2.22	321.42	0.27	0.12	0.10	0.27	4.149	0.204	0.976226444	2.31659	0.4486

1	19.13	11.58
2	11.06	9.37
3	30.10	14.28
4	13.44	7.96
5	17.43	10.07
6	9.79	8.82
7	9.74	7.69
8	12.29	8.68
9	19.56	15.16


RS-349 sanidine
Henry - NBMG
Age = 8.8 ± 4.7 Ma
40/36 intercept:300 ± 12
MSWD = 0.048
0.0038
0.0036
0.0034
0.0032
0.0030
0.0028
0.0026
0.0024
36Ar/40Ar
0.00
0.01
0.02
0.03
39Ar/40Ar

Kurt Allen

From: Randy Vance [RVAN1@corp.newmont.com]
Sent: Monday, October 18, 1999 9:26 AM
To: chenry@unr.edu
Cc: kallen@hecla-mining.com
Subject: Rosebud Age-dating Samples

Chris,

Did you have a look at the alunite samples, and are they of sufficient quality for dating? Please select the best one. If they are comparable, I'd recommend the one with the highest gold content (64320).

I've consulted with Kurt and authorize you to proceed with dating the following five Rosebud samples, with the understanding that the cost will be about $2900 ($700 each for the alunite and illite, $500 each for the sanidine):

1. One of the alunite samples, North Zone
2. Illite from the North Zone, stope 34
3. Sanidine from the Bud Marker Porphyry, East Zone
4. Sanidine from the Rosebud quartz latite, Arch ridge near White Alps (NWRA2651).
5. Sanidine from Big Chocolate Mountain (NWRA2652B)

This suite should offer a good spread on the age of the volcanics (#5), the age of late intrusions(#3,#4), and the age of mineralization(#1,#2). Can you estimate the timetable for completion of the work, and when the invoice will be due?

Sincerely,
Randy

Nevada Isotope Geochronology Laboratory

University of Nevada, Las Vegas
Department of Geoscience, Rm 107
4505 Maryland Parkway
Las Vegas, NV 89154-4010

Terry Spell office: 702-895-1171 (tspell@ccmail.nevada.edu)
Kathy Zanetti office: 702-895-4789 (kzanetti@ccmail.nevada.edu)
Laboratory: 702-895-2353 FAX: 702-895-4064

NIGL INVOICE

Customer

Name: Kurt Allen, Chief Geologist
Address: Rosebud Mining Company LLC
PO Box 2610, 58 miles west of
City: Winnemucca State: NV ZIP: 89446
Phone: 775-623-6912 FAX: 702-623-6967

Date	06/05/00
Order No.	6
Invoice No.	20

Sample	Description	Unit Price	TOTAL
	$^{40}Ar/^{39}Ar$ furnace step heat analysis		
34-3-1	10 step heat analyses - illite	$600.00	$600.00
64320	7 step heat analyses - alunite	$600.00	$600.00
	$^{40}Ar/^{39}Ar$ CO_2 laser fusion analysis		
NWRA 2651	10 laser fusion analyses - sanidine	$400.00	$400.00
NWRA 2652B	10 laser fusion analyses - sanidine	$400.00	$400.00
	Note: Please make all checks payable to the **Board of Regents** and return to the above address.		
		Subtotal	$2,000.00
		TOTAL	$2,000.00

86-2524-542

EAA