Electronic Supplementary Material (ESI) for Journal of Analytical Atomic Spectrometry.

Supplementary materials

Table S1. Tungsten isotope results for Alfa Aesar W standard solution (50ppb) with different combinations of cones, For Alfa Aesar W standard, $\varepsilon^{182}W/^{184}W$ (6/4) = [($^{182}W/^{184}W_{(6/4)}$ - $^{182}W/^{184}W_{(6/4)\ mean}$)/ $^{182}W/^{184}W_{(6/4)\ mean}$] × 10000, $\varepsilon^{182}W/^{184}W$ (6/3) = [($^{182}W/^{184}W_{(6/3)}$ - $^{182}W/^{184}W_{(6/3)\ mean}$)/ $^{182}W/^{184}W_{(6/3)\ mean}$] × 10000

	^{184}W	$^{182}W/^{184}W$ (6/4)	2σ	$^{183}W/^{184}W$ (6/4)	2σ	$^{184}W/^{183}W$ (6/3)	2σ	$^{182}W/^{184}W$ (6/3)	2σ	$\varepsilon^{182}W/^{184}W$ (6/4)	2σ	$\varepsilon^{182}W/^{184}W$ (6/3)	2σ
Standard sample cone + H skimmer cone (100 cycles/run)	2.90	0.864892	0.000011	0.467129	0.000006	2.140752	0.000017	0.864879	0.000009	0.05	0.13	0.00	0.10
	2.91	0.864880	0.000011	0.467122	0.000005	2.140773	0.000016	0.864876	0.000009	-0.09	0.13	-0.04	0.10
	2.92	0.864886	0.000012	0.467125	0.000005	2.140765	0.000015	0.864878	0.000009	-0.03	0.14	-0.01	0.10
	2.96	0.864888	0.000012	0.467130	0.000006	2.140750	0.000017	0.864874	0.000009	0.00	0.14	-0.06	0.10
	2.96	0.864881	0.000011	0.467128	0.000005	2.140756	0.000015	0.864870	0.000009	-0.08	0.12	-0.10	0.10
	2.94	0.864894	0.000011	0.467128	0.000006	2.140756	0.000017	0.864883	0.000009	0.06	0.13	0.04	0.10
	2.97	0.864899	0.000012	0.467133	0.000005	2.140740	0.000016	0.864881	0.000009	0.12	0.14	0.02	0.10
	2.96	0.864889	0.000013	0.467124	0.000006	2.140767	0.000018	0.864882	0.000009	0.01	0.15	0.03	0.10
	2.95	0.864895	0.000010	0.467127	0.000005	2.140758	0.000015	0.864885	0.000009	0.08	0.12	0.07	0.10
	2.95	0.864879	0.000011	0.467121	0.000005	2.140777	0.000015	0.864877	0.000009	-0.10	0.13	-0.03	0.10
	2.94	0.864875	0.000009	0.467122	0.000005	2.140773	0.000015	0.864870	0.000009	-0.15	0.10	-0.10	0.10
	2.97	0.864886	0.000013	0.467126	0.000005	2.140760	0.000016	0.864877	0.000009	-0.02	0.15	-0.03	0.10
	2.94	0.864881	0.000012	0.467124	0.000006	2.140768	0.000017	0.864875	0.000009	-0.08	0.13	-0.05	0.10
	2.93	0.864888	0.000012	0.467124	0.000005	2.140767	0.000016	0.864882	0.000009	0.00	0.13	0.03	0.10
	2.83	0.864900	0.000012	0.467129	0.000005	2.140753	0.000015	0.864888	0.000009	0.14	0.14	0.11	0.10
	2.83	0.864892	0.000012	0.467127	0.000005	2.140758	0.000017	0.864882	0.000009	0.05	0.14	0.03	0.10
	2.75	0.864894	0.000011	0.467128	0.000005	2.140755	0.000016	0.864883	0.000009	0.07	0.13	0.04	0.10
	2.62	0.864885	0.000015	0.467122	0.000007	2.140773	0.000021	0.864881	0.000009	-0.03	0.17	0.02	0.10
	2.61	0.864889	0.000013	0.467126	0.000006	2.140762	0.000017	0.864880	0.000009	0.01	0.15	0.01	0.10
Mean		0.864888						0.864879		0.00		0.00	
2σ SD (n = 19)		0.000014						0.000009		0.16		0.11	
Standard sample cone + X skimmer cone (100 cycles/run)	5.73	0.864891	0.000009	0.467133	0.000004	2.140741	0.000012	0.864874	0.000007	0.05	0.10	0.02	0.08
	5.50	0.864885	0.000011	0.467129	0.000004	2.140752	0.000012	0.864872	0.000007	-0.02	0.13	0.00	0.08
	5.63	0.864892	0.000009	0.467132	0.000004	2.140743	0.000013	0.864876	0.000007	0.06	0.11	0.04	0.08
	5.63	0.864885	0.000010	0.467129	0.000004	2.140751	0.000012	0.864872	0.000007	-0.02	0.11	0.00	0.08
	5.73	0.864889	0.000008	0.467131	0.000004	2.140746	0.000012	0.864874	0.000007	0.02	0.10	0.02	0.08
	5.51	0.864885	0.000011	0.467129	0.000004	2.140752	0.000011	0.864873	0.000007	-0.02	0.13	0.00	0.08
	5.79	0.864886	0.000008	0.467129	0.000004	2.140751	0.000012	0.864873	0.000007	-0.01	0.09	0.00	0.08
	5.72	0.864885	0.000008	0.467131	0.000003	2.140747	0.000010	0.864870	0.000007	-0.03	0.09	-0.02	0.08
	5.66	0.864887	0.000009	0.467132	0.000004	2.140744	0.000011	0.864871	0.000007	0.00	0.10	-0.02	0.08
	5.72	0.864885	0.000008	0.467130	0.000003	2.140748	0.000010	0.864871	0.000007	-0.02	0.09	-0.02	0.08
	5.80	0.864891	0.000009	0.467132	0.000004	2.140742	0.000011	0.864875	0.000007	0.05	0.10	0.03	0.08
	5.66	0.864886	0.000009	0.467133	0.000004	2.140739	0.000012	0.864868	0.000007	-0.01	0.10	-0.05	0.08
	5.79	0.864886	0.000007	0.467130	0.000004	2.140748	0.000011	0.864872	0.000007	-0.02	0.08	-0.01	0.08
	5.72	0.864887	0.000008	0.467132	0.000003	2.140743	0.000011	0.864871	0.000007	0.00	0.09	-0.02	0.08

	5.75	0.864889	0.000009	0.467130	0.000004	2.140749	0.000013	0.864875	0.000007	0.02	0.10	0.03	0.08
	5.75	0.864885	0.000008	0.467131	0.000004	2.140746	0.000012	0.864870	0.000007	-0.02	0.10	-0.03	0.08
	5.79	0.864888	0.000008	0.467130	0.000004	2.140750	0.000011	0.864875	0.000007	0.01	0.09	0.03	0.08
	5.76	0.864883	0.000008	0.467128	0.000003	2.140755	0.000011	0.864872	0.000007	-0.05	0.09	-0.01	0.08
	5.72	0.864889	0.000008	0.467131	0.000004	2.140746	0.000011	0.864874	0.000007	0.03	0.09	0.02	0.08
Mean		0.864887						0.864873		0.00		0.00	
2σ SD (n = 19)		0.000005						0.000004		0.06		0.05	
	9.49	0.864911	0.000008	0.467136	0.000003	2.140730	0.000009	0.864890	0.000006	-0.02	0.09	-0.01	0.07
	9.43	0.864910	0.000006	0.467135	0.000003	2.140732	0.000009	0.864889	0.000006	-0.04	0.07	-0.02	0.07
	9.53	0.864912	0.000008	0.467137	0.000005	2.140728	0.000014	0.864890	0.000006	-0.01	0.10	-0.01	0.07
	9.68	0.864907	0.000006	0.467134	0.000003	2.140738	0.000009	0.864889	0.000006	-0.07	0.06	-0.03	0.07
	9.74	0.864919	0.000009	0.467142	0.000008	2.140712	0.000024	0.864890	0.000006	0.07	0.11	-0.01	0.07
	9.77	0.864916	0.000008	0.467139	0.000005	2.140722	0.000015	0.864892	0.000006	0.04	0.09	0.01	0.07
	9.84	0.864913	0.000008	0.467137	0.000004	2.140726	0.000012	0.864890	0.000006	0.00	0.09	-0.01	0.07
Jet sample	9.90	0.864910	0.000006	0.467137	0.000003	2.140729	0.000008	0.864888	0.000006	-0.03	0.07	-0.03	0.07
cone + X	9.94	0.864915	0.000005	0.467137	0.000003	2.140727	0.000008	0.864892	0.000006	0.02	0.06	0.01	0.07
skimmer	10.01	0.864910	0.000006	0.467134	0.000003	2.140735	0.000009	0.864891	0.000006	-0.03	0.07	0.00	0.07
cone (100	10.00	0.864915	0.000006	0.467135	0.000003	2.140733	0.000009	0.864894	0.000006	0.02	0.07	0.04	0.07
cycles/run)	10.04	0.864911	0.000006	0.467135	0.000003	2.140733	0.000008	0.864891	0.000006	-0.02	0.07	0.00	0.07
	10.10	0.864914	0.000009	0.467137	0.000006	2.140727	0.000018	0.864891	0.000006	0.01	0.10	0.00	0.07
	9.97	0.864909	0.000006	0.467132	0.000003	2.140744	0.000009	0.864893	0.000006	-0.05	0.07	0.02	0.07
	10.12	0.864912	0.000009	0.467137	0.000006	2.140728	0.000019	0.864890	0.000006	-0.01	0.11	-0.01	0.07
	10.15	0.864917	0.000006	0.467139	0.000003	2.140721	0.000008	0.864892	0.000006	0.05	0.07	0.01	0.07
	10.11	0.864919	0.000008	0.467138	0.000005	2.140724	0.000015	0.864895	0.000006	0.06	0.09	0.04	0.07
	10.20	0.864913	0.000006	0.467136	0.000003	2.140731	0.000008	0.864892	0.000006	0.00	0.07	0.01	0.07
	10.36	0.864913	0.000006	0.467136	0.000003	2.140730	0.000008	0.864891	0.000006	0.00	0.07	0.00	0.07
Mean		0.864913						0.864891		0.00		0.00	
2σ SD (n = 19)		0.000006						0.000003		0.08		0.04	
	5.38	0.864890	0.000003	0.467125	0.000002	2.140764	0.000005	0.864882	0.000002	0.01	0.04	0.01	0.03
	5.32	0.864886	0.000003	0.467124	0.000002	2.140766	0.000005	0.864879	0.000003	-0.03	0.04	-0.02	0.03
	5.49	0.864889	0.000003	0.467125	0.000002	2.140763	0.000005	0.864882	0.000003	0.01	0.04	0.01	0.03
Standard	5.26	0.864890	0.000003	0.467124	0.000002	2.140767	0.000005	0.864883	0.000002	0.02	0.04	0.02	0.03
sample	5.34	0.864886	0.000003	0.467123	0.000002	2.140769	0.000005	0.864881	0.000003	-0.03	0.04	-0.01	0.03
cone + X	5.26	0.864890	0.000004	0.467125	0.000002	2.140766	0.000005	0.864884	0.000003	0.02	0.04	0.04	0.03
skimmer	5.15	0.864890	0.000003	0.467125	0.000002	2.140763	0.000005	0.864882	0.000002	0.01	0.04	0.01	0.03
cone (640	5.15	0.864891	0.000003	0.467126	0.000002	2.140760	0.000005	0.864882	0.000003	0.03	0.04	0.01	0.03
cycles/run)	5.15	0.864886	0.000004	0.467125	0.000002	2.140764	0.000005	0.864879	0.000003	-0.03	0.04	-0.03	0.03
	5.15	0.864887	0.000004	0.467126	0.000002	2.140760	0.000005	0.864878	0.000003	-0.02	0.04	-0.04	0.03
	5.50	0.864890	0.000003	0.467126	0.000002	2.140761	0.000005	0.864881	0.000003	0.01	0.04	0.00	0.03
	5.28	0.864888	0.000003	0.467125	0.000002	2.140765	0.000005	0.864881	0.000003	0.00	0.04	0.00	0.03
Mean		0.864889						0.864881		0.00		0.00	
2σ SD		0.000004						0.000004		0.04		0.04	

(n=12)													
Jet sample	8.32	0.864852	0.000003	0.467124	0.000002	2.140766	0.000006	0.864847	0.000002	0.01	0.04	0.00	0.03
cone + X	8.19	0.864851	0.000003	0.467123	0.000001	2.140770	0.000004	0.864846	0.000002	-0.01	0.03	-0.02	0.03
skimmer	7.98	0.864853	0.000003	0.467123	0.000001	2.140771	0.000004	0.864848	0.000002	0.02	0.03	0.01	0.03
cone (640	7.94	0.864852	0.000003	0.467123	0.000002	2.140771	0.000005	0.864848	0.000002	0.00	0.03	0.01	0.03
cycles/run)	7.87	0.864850	0.000003	0.467121	0.000002	2.140775	0.000005	0.864847	0.000002	-0.02	0.04	0.00	0.03
Mean		0.864852						0.864847		0.00		0.00	
2σ SD (n = 5)		0.000002						0.000002		0.03		0.02	

Table S2. Experimental slopes of three-isotope plot obtained from measured W isotopic ratios for Alfa Aesar W standards.

Date	Data points	$\ln r^{182/184}$ vs. $\ln r^{186/184}$			$\ln r^{182/183}$ vs. $\ln r^{186/183}$		
		β	σ	r^2	β	σ	r^2
2017.07.26	6	-1.04961	0.03191	0.99632	-0.29601	0.03636	0.94308
2017.07.27	11	-1.00599	0.00082	0.99999	-0.33547	0.000901	0.99994
2017.07.28	8	-1.00191	0.00442	0.99988	-0.32613	0.0052	0.99848
2017.07.29	6	-1.02186	0.01341	0.99931	-0.32966	0.01768	0.98862
2017.07.30	11	-1.00881	0.00537	0.99974	-0.30552	0.01049	0.98951
20.7.12.29	10	-0.99941	0.00203	0.99997	-0.31596	0.00658	0.99654
2017.12.30	9	-1.00092	0.00412	0.99988	-0.32609	0.00296	0.99942
2018.01.09	8	-1.014	0.00448	0.99988	-0.32555	0.00313	0.99945
2018.01.11	8	-0.99558	0.00383	0.99991	-0.32149	0.00428	0.99894
2018.01.12	5	-1.00919	0.01937	0.9989	-0.3246	0.0075	0.9984
2018.01.14	10	-1.04389	0.00813	0.99951	-0.34549	0.003	0.9994
2018.01.15	9	-0.99937	0.00194	0.99997	-0.33388	0.000682	0.99997