



Arsenic Speciation

TestAmerica offers a unique capability for the determination of selected species of arsenic. Our analytical technique couples high performance liquid chromatography (HPLC) with inductively coupled plasma/mass spectrometry (ICP-MS) for the determination of Arsenite and Arsenate.

The need for metals speciation analysis has increased as researchers seek to better understand treatment technologies and the fate and transport of Arsenic in the environment. Arsenic exists primarily as Arsenite or Arsenate in the environment. Arsenites are much more soluble than arsenates and have the highest level of toxicity of any of the arsenic species commonly found in the environment.

Arsenic is naturally present in coal, and as a result, can be present in the residual products of coal combustion. During combustion, most trace elements are retained in the coal ash and are concentrated in the smaller volume of the ash (Carlson and Adriano, 1993; Meij, 1994; Jankowski and others, 2006). The concentrated Arsenic in coal ash can leach in to the environment in a wide range of concentrations. Knowing which species are present, their concentrations and their potential for leaching in to the environment can be useful for determining the beneficial use of coal combustion residuals such as fly ash, bottom ash and flue gas solids.

Arsenic is also regulated in the Utility Segment under the EPA's new Effluent Limitations Guidelines (ELG) for FGD scrubber wastewater. For existing facilities, the ELG daily maximum limit and monthly average limit for total arsenic is 11 $\mu\text{g/L}$ and 8 $\mu\text{g/L}$, respectively. The solubility of arsenic is dependent on its oxidation state. Arsenite is soluble in water and arsenate is sparingly soluble in water. To remove arsenic from the wastewater, the arsenite can be converted to arsenate or other insoluble forms of arsenic. Having the capability to measure the speciation of arsenic is critical in understanding the chemistry of the wastewater and for the evaluation of wastewater treatment technologies.

Analyte		CAS #	RL($\mu\text{g/L}$)
Arsenite	As+3	15502-74-6	2
Arsenate	As+5	15584-04-0	2

22.990	24.305	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar		
39.098	40.078	44.956	47.867	50.942	51.996	54.938	55.845	58.933	58.693	63.546	65.38	69.723	72.64	74.922	78.96	79.904	79.904		
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
87.62	88.906	91.224	92.906	95.96	[98]	101.07	102.91	106.42	107.87	112.41	114.82	118.71	121.76	127.60	126.90	131.29	132.91		
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
137.327	137.327	174.967	178.48	180.948	187.04	188.906	186.207	189.126	195.084	196.967	200.59	204.38	207.2	208.98	[209]	[210]	210.986	222.018	
Fr	Ba	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	Ac		
[223]	137.327	178.48	180.948	183.84	186.207	187.04	188.906	191.224	192.22	195.084	196.967	200.59	204.38	207.2	208.98	[222]	227.03	232.037	
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tm	Yb	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg
138.905	140.12	140.908	141.904	144.913	150.36	151.964	157.25	158.925	162.50	164.930	167.259	168.934	173.045	175.043	176.032	177.041	178.910	180.938	183.848
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tm	Yb	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl
150.36	151.964	157.25	158.925	162.50	164.930	167.259	168.934	173.045	175.043	176.032	177.041	178.910	180.938	183.848	186.207	188.906	191.224	192.22	195.084
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tm	Yb	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg
174.967	178.48	180.948	183.84	186.207	187.04	188.906	191.224	192.22	195.084	196.967	200.59	204.38	207.2	208.98	[209]	[210]	210.986	222.018	226.025
Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	Ac	Th	Pa	U	Np
178.48	180.948	183.84	186.207	187.04	188.906	191.224	192.22	195.084	196.967	200.59	204.38	207.2	208.98	[209]	[210]	227.03	232.037	238.02891	237.04817
Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	Ac	Th	Pa	U	Np	Pu
180.948	183.84	186.207	187.04	188.906	191.224	192.22	195.084	196.967	200.59	204.38	207.2	208.98	[209]	[210]	232.037	231.03688	238.02891	237.04817	244.06422

TestAmerica offers a comprehensive suite of capabilities to the Utility Sector including RCRA Subtitle D Monitoring for the Coal Combustion Residuals rule, ELG monitoring, decommissioning support, Manufactured Gas Plant assessments, source emissions testing, NPDES discharge testing, flue gas discharge water testing, metals speciation, Leaching Environmental Assessment Framework (LEAF) Test Methods and 24/7 access to data through TotalAccess®, an online data management system.



Have a Question About Arsenic Speciation Testing? Contact:



Dr. Richard Burrows
Corporate Technical Director,
TestAmerica
4955 Yarrow Street
Arvada, CO 80002
Phone: 303.736.0100

You may also contact Dr. Burrows through the TestAmerica website at:
<http://www.testamericainc.com/services/asktheexpert/experts/richard-burrows/>



Ask about TestAmerica's Comprehensive Utility Segment Services

- Programmatic Groundwater Monitoring for Coal Combustion Residuals
- Effluent Limitation Guideline Testing
- ICP/MS analysis of Flue Gas Desulfurization Waters
- Decommissioning Support
- Next Generation Leaching Testing - LEAF Methods
- Manufactured Gas Plant Support
- NPDES Monitoring
- Selenium Speciation
- Source Emissions Testing

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone: 303.736.0100

For customer service or to request a quote, please contact:

Client Relations Manager
Brett Vandelinder
Phone: 303.736.0112
Brett.Vanderlinder@TestAmericaInc.com

Project Manager
Patrick McEntee
Phone: 303.736.0100
Patrick.McEntee@TestAmericaInc.com

