



A Chelex[®] method for the determination of metals bioavailability in natural waters

In water quality monitoring for ecosystem protection, or where water quality is affected by the presence of trace metals, the Bioavailability of said metals, not just the concentration of elements in the dissolved phase, can be critical in the assessment of toxicity

Metals toxicity is linked to the ability to compete for intracellular sites normally occupied by functional metabolites, thereby interfering with normal cell functions.

Bioavailability can be defined as: "the ability of a metal to bind or traverse the cell surface of an organism"

The amount of trace metals in the dissolved form, generally, contains the majority of the bioavailable forms.

A simple method (NATA Accredited) of estimating the bioavailability is performed by Envirolab Sydney for the determination of Chelex - Bioavailable Metal Speciation in natural waters.

The Chelex[®] method results in an estimation of the bioavailability by determining the affinity of the metals for a Chelex[®] resin under certain conditions (see reference below for more detail)s.

- Samples should be either 0.45µm or 0.1µm field filtered into an unpreserved metals bottle.
- NATA Accreditation covers: Al, Ba, Be, Cd, Cr, Cu, Co, Fe, Pb, Mn, Mo, Ni, Sn, V, Zn, Hg.

Envirolab Services Sydney is the first commercial laboratory to be NATA Accredited for the determination of Bioavailable Metals by the Chelex method.

FOR FURTHER INFORMATION AND TECHNICAL ASSISTANCE CONTACT

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(02) 9910 6200 or www.envirolabservices.com.au

Reference: Bowles, Apte, Batley, Hales, Rogers, CSIRO – A Rapid Chelex Column Method For The Determination of Metal Speciation in Natural Waters.

SPECIALISING IN



SOIL
Contaminated Sites



WATER
Ground Surface Drinking Trade waste Saline



AIR
Indoor Workplace Emissions Ambient



ASBESTOS
Buildings Soil



SPOCAS
Acid Sulphate Soil AMD



Reporting Bioavailable Elements

Analytes	Total Metals (in µg/L)	Filtered 0.45 µm (in µg/L)	Filtered 0.10 µm (in µg/L)	Filtered 0.45 µm Post Chelex™	Metals Retained by Chelex™ 0.45µm (in µg/L)	Chelex™ (in %)
Al	800	650	500	80	570	87.7%
Ba	60	50	25	10	40	80.0%
Be	45	28	22	9	19	67.8%
Cd	10	8	7	2	6	75.0%
Co	200	175	160	50	125	71.4%
Cr	50	45	45	40	5	11.1%
Cu	650	620	560	320	300	48.4%
Fe	2000	1700	1300	600	1100	64.7%
Pb	50	45	45	40	5	11.1%
Mn	2000	1800	1300	700	1100	61.1%
Mo	35	33	33	20	13	39.4%
Hg	0.6	0.6	0.5	<0.1	N/A	100%
Ni	200	180	175	30	150	83.3%
Sn	38	34	30	18	16	47.0%
V	85	61	52	30	31	50.8%
Zn	1500	1300	1200	400	900	69.2%
	1	2	3	4	5	6

1)



Metals by ICP MS after digestion with a mix of acids

2)



Metals results after filtration of the samples through 0.45 µm (field filtered) and determination by an ICP-MS

3)



Metals results after filtration of the samples through 0.10 µm (field filtered) and determination by an ICP-MS

4)



Metals results in the elutriate after the sample has been passed through the Chelex™ resin. This can be the result of the sample filtered through a 0.45 µm filter or a 0.1 µm filter (in this case, 0.45 µm as an example)

5)



This is the difference between 2) and 4). Basically, the difference of the Metals concentration before the Chelex™ and post Chelex™. These are the "bioavailable" metals.

6)



Chelex retained metals but in %. Basically, the difference of the Metals concentration before the Chelex™ and post Chelex™, but in %.

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