



The wise choice

Inorganic Trace Analysis

Pure confidence





Inorganic Trace Analysis, the measurement of trace concentrations of elements, is more and more commonly performed. The most used techniques include Atomic Absorption Spectroscopy (AAS) and Inductively Coupled Plasma (ICP).

Over the years, Scharlab has developed a whole range of products for this purpose, including standards and ultrapure acids, to guarantee optimum results when analysing inorganic traces by any of the above mentioned techniques.

Atomic Absorption Spectroscopy (AAS)

AAS uses absorption spectroscopy to assess the concentration of an analyte in a sample and requires standards with known analyte content to establish the relationship between the measured absorbance and the analyte concentration. Depending on the atomiser used (flame or graphite tube) AAS can be:

Flame Atomic Absorption Spectroscopy (FAAS)

FAAS uses a flame to dissociate the sample into free atoms. After dissociation, light from a hollow cathode lamp passes through the cloud of atoms and those of interest absorb it at a characteristic wavelength. The amount of light absorbed will be directly proportional to the concentration of the element in the original sample.

The typical detection limits for this technique are around 10-100 ppb.

Graphite Furnace Atomic Absorption Spectroscopy (GFAAS)

In GFAAS, the flame has been replaced by a graphite tube, which is heated to remove the solvents and matrix and dissociates the sample. Once it is totally atomised, the atoms are retained in the tube for a longer period of time, which makes the technique's sensitivity significantly higher than that of flame AAS. In this case, the detection limits are usually around 10-100 ppt.

Depending on the technique used, the standards and the quality of the acids needed for optimum results will be different.

ICP

ICP is a technique used for elemental analysis which atomises and ionises the elements of a sample and combines with Optical Emission Spectroscopy (ICP-OES) or Mass Spectroscopy (ICP-MS) for its detection. Unlike atomic absorption spectroscopy, which usually measures one single element at a time, ICP has the capacity to scan for various elements simultaneously.

ICP-OES

Inductively coupled plasma optical emission spectroscopy (ICP-OES) is a type of emission spectroscopy that uses an argon plasma to atomise and ionise the sample. Once dissociated, the atoms or ions are excited and emit light of a characteristic wavelength. The intensity of this emission is used to calculate the concentration of the element in the sample.

Typical detection limits for this technique are around 1-10 ppb.

ICP-MS

This technique also uses argon plasma to dissociate the sample into atoms and ions, but in this case the mass spectrometer detects the actual ions instead of the light they emit. Once extracted from the plasma, the ions continue to the mass spectrometer, where they are separated according to their atomic mass-charge ratio. In this case, detection limits are usually around 1-10 ppt.



Scharlau Reagent grade Acids

This is the routine used grade for laboratory analytical work and comprises high quality chemicals for laboratory and specialised industrial use. Analytical reagents are in most cases ISO and ACS labelled.

Scharlau reagent grade acids are a competitive choice for inorganic trace analysis by FAAS.

- Up to 34 elements analysed.
- Available in 1 l and 2,5 l glass bottles and HDPE bottles, and the more concentrated acids are also in safe plastic-coated bottles.

Scharlau Reagent grade Acids with low mercury content

Mercury is a highly toxic contaminant that enters the human food chain through river and sea water. Mercury analysis of fish is performed by means of CVAAS (Cold Vapour Atomic Absorption Spectroscopy). Before the analysis, the samples are digested in mineral acids, which must be mercury-free.

Our low mercury content acids have a guaranteed maximum of 5 ppb of Hg, which is optimum for the determination of mercury.

- Up to 34 elements analysed, each of them has a guaranteed maximum of 500 ppb per element, most of them at levels between 10 and 50 ppb.
- Available in 1 l and 2,5 l glass bottles.
- Comply with ACS and ISO.

Description	Art. No.
Acetic acid glacial, ExpertQ®, reagent grade, ACS ISO	AC0353
Hydrochloric acid, 37%, ExpertQ®, reagent grade, ACS, ISO	AC0741
Nitric acid, solution min. 65%, ExpertQ®, reagent grade, ISO Ph Eur	AC1601
Nitric acid 69,5%, ExpertQ®, reagent grade, ACS ISO	AC1600
Sulfuric acid 95-97%, ExpertQ®, reagent grade, ISO	AC2067

Description	Art. No.
Hydrochloric acid, 37%, ExpertQ®, reagent grade, ACS, ISO	AC0730
Nitric acid, min. 69,5%, ExpertQ®, reagent grade, ACS, ISO	AC1607
Nitric acid, solution min. 65% w/w, ExpertQ®, reagent grade, ISO	AC1605
Sulfuric acid, 95-98%, ExpertQ®, reagent grade, ACS, ISO	AC2097

Scharlau AAS Standards

Used as external standards to calibrate AAS equipment, these must have a very accurate concentration.

Our AAS standards are manufactured using high purity elements and acids to guarantee optimum performance and reliable results. They all have a concentration of 1000 ppm of the element.

- ◆ Available in 100 and 500 mL HDPE bottles, with the exception of gold and mercury, which is available in glass bottles.
- ◆ All traceable to NIST and the number of the standard they are traceable to is available on each Certificate of Analysis.
- ◆ The Certificate of Analysis is always supplied with the product.
- ◆ Tested by gravimetric, volumetric or ICP methods.

Each standard contains the element dissolved in the most suitable matrix.

Standard solutions 1000 mg/l Al for AA

																		He					
Li LI0061																		B BO0014	C	N	O	F	Ne
Na SO0006	Mg MA0012																	Al AL0755	Si SI0013	P	S	Cl	Ar
K PO0106	Ca CA0177	Sc	Ti TI0365	V VA0072	Cr CR0223	Mn MA0112	Fe HI0305	Co CO0016	Ni NI0122	Cu CO0086	Zn CI0127	Ga	Ge	As AR0152	Se SE0012	Br	Kr						
Rb	Sr ES0178	Y	Zr	Nb	Mo MO0022	Tc	Ru	Rh	Pd	Ag PL0006	Cd CA0042	In	Sn ES0062	Sb AN0442	Te	I	Xe						
Cs	Ba BA0011	La	Hf	Ta	W TU0012	Re	Os	Ir	Pt	Au OR0058	Hg ME0112	Tl	Pb PL0106	Bi BI0131	Po	At	Rn						
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og						

› Standards of elements not included in this table upon request.

Ultratrace® Ultrapure Acids

Ultrapure reagents are needed in the digestion of solid samples prior to analysis using atomic spectroscopy methods such as ICP or AAS. These techniques have very low detection limits: parts per billion (ppb) or parts per trillion (ppt). It is crucial that the ultrapure acids are free of elements traces.

Scharlab offers **Ultratrace®**, a wide range of ppb-grade and ppt-grade ultrapure reagents for inorganic trace analysis. Ultratrace® comprises extremely pure acids and reagents in two grades:

Ultratrace® ppb grade

Ultratrace® ppt grade

- ◆ Outstanding low metal content.
- ◆ Analytical results for more than 60 elements, determined using ICP-MS.
- ◆ Ultratrace® undergo a proprietary purification process.
- ◆ Products and bottles are manufactured under trace elemental clean conditions.



Ultratrace® ppb grade

Our ppb grade comprises acids and ammonia, for optimum result when analysing inorganic traces.

- All of them certified at maximum element impurity levels of 1 part per billion (ppb).
- Available in 500 mL and 1 l bottles, and hydrochloric and nitric acid also in 2,5 l bottles.
- All packed in PE bottles with the exception of perchloric acid, which is packed in glass bottles.
- ◆ The PE bottles are lighter, safer and more suitable as they do not transfer any elemental impurities into the acids.

Ultratrace® ppt grade

Our ppt grade line includes acids, ammonia, hydrogen peroxide and water.

- All of them certified at maximum element impurity levels of 100 part per trillion (ppt).
- All packaged in PTFE, PFA and FEP fluoropolymer bottles with the exception of ammonia and water, which are packed in PE bottles.
- Available in 250 mL and 500 mL bottles, and water in 1 l bottles.
- The PTFE, PFA and FEP fluoropolymer containers are optimum for maintaining the product in excellent condition during its shelf life.

Description	Art. No.
Acetic acid glacial Ultratrace®, ppb-trace analysis	AC0358
Ammonia, solution 20-22% Ultratrace®, ppb-trace analysis	AM0269
Hydrochloric acid, 37% Ultratrace®, ppb-trace analysis	AC0780
Hydrofluoric acid, 48% Ultratrace®, ppb-trace analysis	AC1061
Nitric acid, 69% Ultratrace®, ppb-trace analysis	AC1617
Perchloric acid, 70% Ultratrace®, ppb-trace analysis	AC1761
Sulfuric acid, 96% Ultratrace®, ppb-trace analysis	AC2114

Description	Art. No.
Acetic acid glacial Ultratrace®, ppt-trace analysis	AC0359
Ammonia, solution 20-22% Ultratrace®, ppt-trace analysis	AM0272
Hydrochloric acid, 35% Ultratrace®, ppt-trace analysis	AC0781
Hydrofluoric acid, 48% Ultratrace®, ppt-trace analysis	AC1062
Hydrogen peroxide, solution 30% w/w (110 vol) Ultratrace®, ppt-trace analysis	HI0143
Nitric acid, 69% Ultratrace®, ppt-trace analysis	AC1618
Sulfuric acid, 96% Ultratrace®, ppt-trace analysis	AC2115
Water Ultratrace®, ppt-trace analysis	AG0016



Scharlau ICP Standards

Used as external standards for the calibration of ICP equipments. Due to its higher sensitivity the ICP technique requires standards of extremely high purity:

- Manufactured with ultra high purity elements and acids, Scharlau ICP standards guarantee optimum performance and reliable results.
- Our ICP standards are prepared starting from elements having a minimum purity of 99.99%, dissolved in ultrapure acids.
- Directly traceable to the NIST.
- Wide range of single element standards and also multi-element mixtures under request.
- Packed in 100 mL HDPE bottles, previously leached with acid, to ensure the absence of impurities.
- Translucent bottles: the remaining product is always visible.
- The Certificate of Analysis is always supplied with the product.
- Tested by gravimetric, volumetric or ICP methods.



All our ICP standards are made in aqueous matrix.

ICP, just like AAS, is not an absolute technique, so it needs standards of a known concentration of the element/s to be able to determine the concentration of the element present in the original sample.

ICP Single Element Standards 1000 ppm ICP Standard solutions

H																	He
Li LI0064	Be BE0346																
Na SO0009	Mg MA0016																
K PO0111	Ca CA0181	Sc ES0021	Ti TI0366	V VA0076	Cr CR0227	Mn MA0116	Fe HI0291	Co CO0014	Ni NI0126	Cu CO0081	Zn CI0129	Ga GA0036	Ge GE0072	As AR0156	Se SE0016	Br	Kr
Rb RU0021	Sr ES0181	Y IT0011	Zr CI0256	Nb NI0071	Mo MO0024	Tc	Ru RU0063	Rh RO0023	Pd PA0066	Ag PL0008	Cd CA0045	In IN0088	Sn ES0066	Sb AN0445	Te TE0023	I	Xe
Cs CE0108	Ba BA0016	La LA0081	Hf HA0011	Ta TA0201	W TU0016	Re RE0078	Os OS0056	Ir IR0011	Pt PT0006	Au OR0063	Hg ME0116	Tl TA0031	Pb PL0108	Bi BI0136	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og
		La CE0038	Pr	Nd	Pm	Sm SA0211	Eu EU0052	Gd GA0011	Tb	Dy DI1301	Ho	Er ER0031	Tm	Yb IT0004	Lu LU0016		

➤ Standards of elements not included in this table upon request.

Custom-made ICP standards

We offer the possibility of supplying multi-element standards for ICP-OES and ICP-MS according to customer needs. Do not hesitate to contact helpdesk@scharlab.com or your commercial agent to receive more information.

ICP Standards Single Element

H																		He
Li LI0065	Be BE0347											B BO0015	C	N	O	F	Ne	
Na SO0011	Mg MA0017											Al AL0756	Si SI0014	P FO0037	S SU0104	Cl	Ar	
K PO0103	Ca CA0183	Sc ES0022	Ti TI0361	V VA0073	Cr CR0224	Mn MA0113	Fe HI0292	Co CO0017	Ni NI0124	Cu CO0082	Zn CI0131	Ga GA0037	Ge GE0073	As AR0154	Se SE0013	Br	Kr	
Rb RU0022	Sr ES0183	Y IT0012	Zr CI0257	Nb NI0072	Mo MO0026	Tc	Ru RU0064	Rh	Pd PA0067	Ag PL0009	Cd CA0043	In IN0089	Sn ES0067	Sb AN0443	Te TE0024	I	Xe	
Cs CE0109	Ba BA0013	La LA0082	Hf HA0012	Ta TA0202	W TU0013	Re RE0079	Os OS0057	Ir IR0012	Pt PT0007	Au OR0059	Hg ME0117	Tl TA0032	Pb PL0109	Bi BI0132	Po	At	Rn	
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	
			La CE0039	Ce PR0012	Pr NE0065	Pm	Sm SA0212	Eu EU0053	Gd GA0012	Tb	Dy DI1302	Ho	Er ER0032	Tm	Yb IT0005	Lu LU0017		

› Standards of elements not included in this table upon request.

ICP Standards Single Element

H																	He	
Li	Be											B MS0011	C	N	O	F	Ne	
Na	Mg MS0026											Al MS0010	Si	P MS0013	S MS0019	Cl	Ar	
K	Ca	Sc MS0021	Ti	V	Cr MS0015	Mn MS0009	Fe MS0012	Co MS0017	Ni MS0016	Cu MS0018	Zn MS0024	Ga	Ge MS0023	As MS0004	Se MS0008	Br	Kr	
Rb	Sr	Y MS0025	Zr	Nb	Mo MS0023	Tc	Ru MS0024	Rh	Pd	Ag	Cd MS0006	In	Sn MS0002	Sb MS0020	Te	I	Xe	
Cs	Ba MS0014	La	Hf	Ta	W MS0022	Re MS0022	Os	Ir	Pt	Au	Hg MS0001	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	

› Standards of elements not included in this table upon request.

ICP Multielement Standards

Description	Art. No.
ICP multielement calibration standard solution, 26 elements	MU0111
ICP multielement calibration standard solution, 9 elements	MU0112
ICP multielement calibration standard solution, 16 elements	MU0113
ICP multielement calibration standard solution, 4 elements	MU0114

Ultrapurpure Acids: Ordering information

		Description	Packaging	Art. No.
Ultratrace®	ppb grade	Acetic acid glacial Ultratrace®, ppb-trace analysis	500 mL	AC03580500
		Ammonia, solution 20-22% Ultratrace®, ppb-trace analysis	500 mL	AM02690500
		Hydrochloric acid, 37% Ultratrace®, ppb-trace analysis	500 mL	AC07800500
			1 l	AC07801000
		Hydrofluoric acid, 48% Ultratrace®, ppb-trace analysis	2,5 l	AC07802500
			500 mL	AC10610500
		Nitric acid, 69% Ultratrace®, ppb-trace analysis	500 mL	AC16170500
			1 l	AC16171000
	ppt grade	Perchloric acid, 70% Ultratrace®, ppb-trace analysis	2,5 l	AC16172500
			500 mL	AC17610500
		Sulfuric acid, 96% Ultratrace®, ppb-trace analysis	1 l	AC21141000
		Acetic acid glacial Ultratrace®, ppt-trace analysis	250 mL	AC03590250
		Ammonia, solution 20-22% Ultratrace®, ppt-trace analysis	250 mL	AM02720250
		Hydrochloric acid, 35% Ultratrace®, ppt-trace analysis	250 mL	AC07810250
			500 mL	AC07810500
		Hydrofluoric acid, 48% Ultratrace®, ppt-trace analysis	1 l	AC07811000
			250 mL	AC10620250
		Hydrogen peroxide, solution 30% w/w (110 vol) Ultratrace®, ppt-trace analysis	500 mL	HI01430500
			250 mL	AC16180250
		Nitric acid, 69% Ultratrace®, ppt-trace analysis	500 mL	AC16180500
			1 l	AC16181000
		Sulfuric acid, 96% Ultratrace®, ppt-trace analysis	250 mL	AC21150250
			500 mL	AC21150500
		Water Ultratrace®, ppt-trace analysis	1 l	AG00161000

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Internal use

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