Metrohm ...

- is the global market leader in titration
- is the only company to offer a complete range of ion analysis equipment – titration, voltammetry, and ion chromatography
- is a Swiss company and manufactures exclusively in Switzerland
- grants a 3-year instrument warranty and a 10-year warranty on chemical suppressors for ion chromatography
- provides you with unparalleled application expertise
- offers you more than 1300 applications free of charge
- supports you with expert service through local representatives and regional support centers
- is not listed on the stock exchange, but is owned by a foundation
- gives the interest of customers and employees priority over maximizing profit

Metrohm – custom solutions for the mining industry

The global mining industry is undergoing massive expansion to meet the increasing demand for minerals and metals. This expansion is taking place in an environment where costs of capital, labour, raw materials and other inputs are all rising, demanding that operations must be run at optimum efficiency.

Accurate and reliable chemical analysis plays a crucial role in meeting these challenges. It is required to keep mining and refining operations at peak efficiency, as well as ensuring that raw materials and products are of the specified quality. Moreover, waste streams and remediation processes require chemical analysis to ensure that environmental impact is minimal.

That's where we come in. Metrohm has been in the business of measurement by chemical analysis for seven decades, and we have been partners of the mining industry for much of that time. Today, we offer a range of instrumentation, software and applications, which are used across the wide spectrum of mining and refining operations throughout the world.

However, it is not enough to have great instrumentation, great software and great applications. Our customers demand and get great service as well. Our global distribution network reaches out to customers around the world, no matter where they are located.

You are invited to browse through this brochure. It is meant to give you an idea of the scope of our expertise in chemical analysis and solutions for your industry. Use it as an introduction and then discuss with your local Metrohm professionals how best Metrohm can work with you to achieve your analytical goals.

Titration

The chemical analysis technique of titration still is a workhorse in the mining and refining industries today. It is generally characterized by high precision and accuracy. As the world leader in automated titration instrumentation for decades, Metrohm offers the widest range of instrumented titration techniques and the most modern instruments on the market. Whatever your titration needs, Metrohm has the instrument and technique to suit. Automated Metrohm titration systems are all served by its class-leading software, ***tiamo***™. You can rely on ***tiamo***™ to deliver the best performance from your instrument, guarantee the safety and security of your results, and integrate perfectly with your plant data-management system.

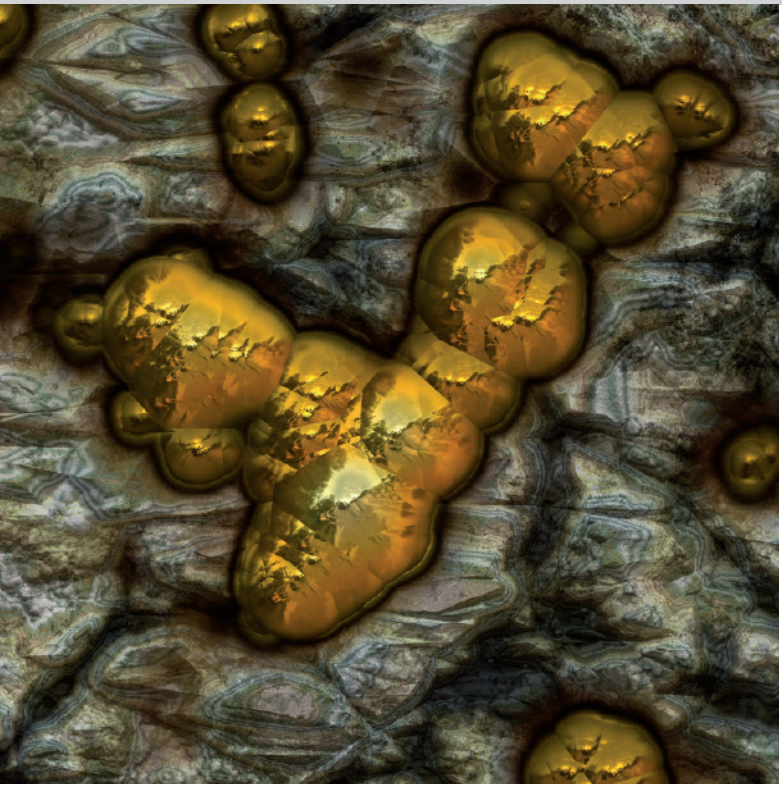
Bayer Liquor analysis: determination of the hydroxyl, carbonate, and aluminum content

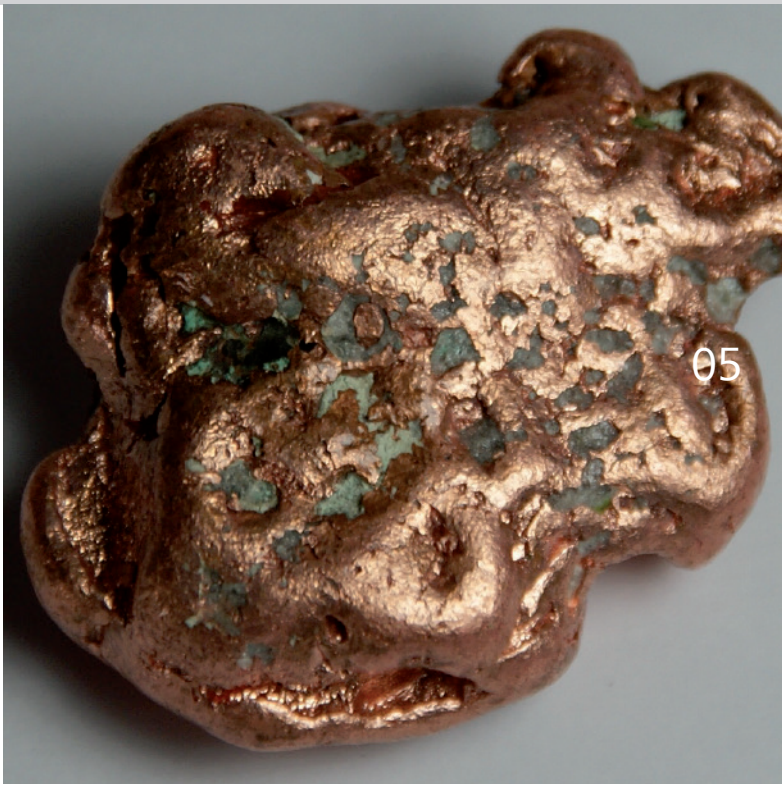
Alumina is obtained from bauxite by wet alkaline digestion according to the Bayer process. The finely grinded bauxite is heated with concentrated sodium hydroxide solution in autoclaves. During this process the Al_2O_3 enters the solution as sodium hydroxialuminate whereas the other metal oxides contained in bauxite remain undissolved. After filtration and dilution of the hot Bayer liquor pure $Al(OH)_3$ is obtained, which is then processed by heating into alumina for the aluminium production.

An aliquot of Bayer liquor is dispensed into a titration vessel. Potassium sodium gluconate solution is added to complex aluminate ions, and release one mol OH- per mol aluminate ion present. These hydroxyl ions, together with hydroxyl ions already present in the liquor are titrated with standard hydrochloric acid. The titration is then automatically stopped, and potassium fluoride solution added to break the alumino-gluconate complex and release 3 mol hydroxyl ion per mol aluminum present. These liberated hydroxyl ions are then titrated with the standard hydrochloric acid, and determined as the alumina content of the liquor. All this steps can also be fully automated.

Determination of iron

After acidic digestion of the iron ore, all Fe(III) is finally reduced to Fe(II) by either $SnCl_2$ (ISO 2597-1) or $TiCl_3$ (ISO 2597-2). An aliquot of the final sample is then titrated with potassium dichromate solution using a color indicator. With modern titration system, the endpoint can either be detected using a photometric sensor (6.1115.000 Optrode) or potentiometrically using a redox electrode instead of a color indicator/photometric sensor.





Determination gold and copper

The simultaneous determination of gold and copper by potentiometric titration uses an Fe(II) solution as titrant. The sample (ore or pure metall) is digested with Aqua Regia. Fe(II) reduces Au(III) directly to the free metal, whereas Cu(II) does not react. By the addition of fluoride ions the Fe(III) is complexed and a shift of the redox potential is effected. Afterwards, potassium iodide is added, thus reducing the Cu(II) to Cu(I), and the free iodine is again titrated with the Fe(II) solution using a Pt Titrode.

Titration applications in «leaching liquors» (examples)

Leaching liquor	Sample	Analyte (Metal)
HNO_3	Iron, manganese, cobalt ores	Mn, Co, Pd, Ag
HNO_3/HCl	Metals, alloys	Ag, Au, Pt, Cr, Ni
HNO_3/HF	Oxide mixtures, alloys	Co, Ti, Sn, Al
H_2SO_4	Chromium ores	Cr
HCl	Iron ores	Fe
NaOH	Bauxite, copper ores	Al, Co, Fe, Si, Ti, S

Important standard applications for titration

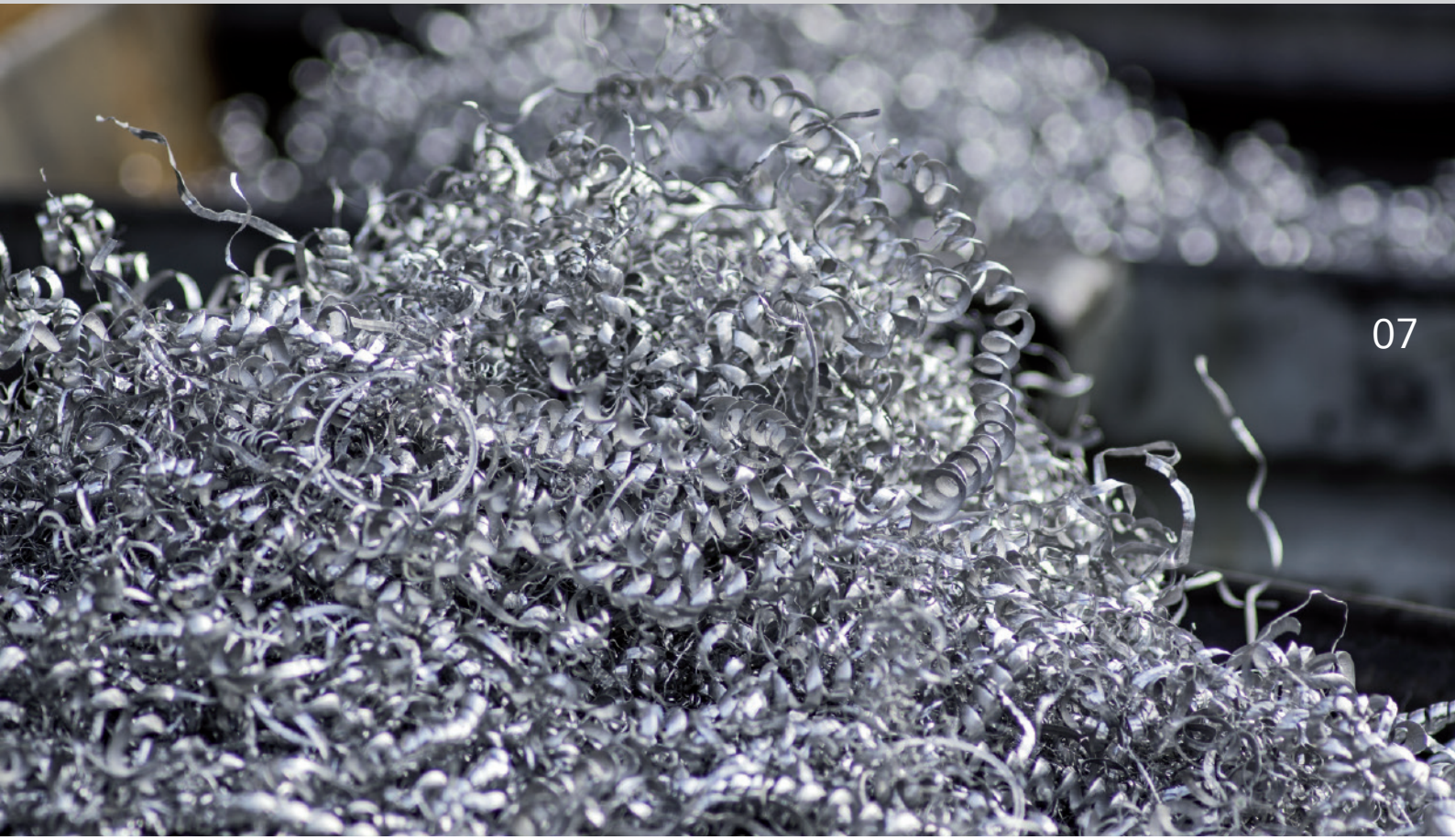
Metal	Standard	Matrix	Method
Copper	ISO 10258:1994	Copper sulfide concentrates	Titrimetric methods
Lead	ISO 11441:1995	Lead sulfide concentrates	Back titration of EDTA after precipitation of lead sulfate
Lead	ISO 13545:2000	Lead sulfide concentrates	EDTA titration method after acid digestion
Zinc	ISO 12739:2006	Zinc sulfide concentrates	Ion-exchange/EDTA titrimetric method
Zinc	ISO 13291:2006	Zinc sulfide concentrates	EDTA titration method after acid digestion
Zinc	ISO 13658:2000	Zinc sulfide concentrates	Hydroxide precipitation and EDTA titrimetric method

Thermometric Endpoint Titration (TET)

Thermometric titration is actually a century old but until recently was not available to the industry as a tool for process and quality control. Metrohm changed this with a robust and reliable automated titration system controlled by the ***tiamo***™ titration software. The 859 Titrotherm offers the industrial analytical chemist the following advantages:

- The Thermoprobe sensor is actually a highly sensitive, fast reacting electronic thermometer that is able to detect endpoints for virtually all titration chemistry types, including acid-base, redox, precipitation, chelation (e.g., EDTA) and titrations in non-aqueous media.
- Because there is no electrical contact with the titration medium, reaction chemistries for which there is no change in electrical potential can be performed. This gives the analyst greater flexibility in determining analytes in difficult matrices as well as in completely anhydrous non-aqueous solutions.
- The Thermoprobe requires no recalibration and maintenance other than occasional cleaning after exposure to some samples. There is no sensing membrane, and no reference junction to foul or clog. Many titrations can be performed in turbid and unfiltered solutions.
- Thermometric titrations are very fast, typically from 30 seconds to a couple of minutes. The fast response allows rapid corrections of sub-optimal process conditions in critical process situations. This means substantial savings in raw materials, energy and improved production.
- Because the 859 Titrotherm detects endpoints on the basis of the rate of change of temperature (and not the actual increase or decrease of the temperature of the solution itself), titrations take place in normal glass or plastic vessels without special need for insulation. The 859 Titrotherm system can be operated in a temperature range to approximately 45 °C.

Thermometric titration can be applied across a range of mineral refining processes. You are invited to discuss the possibility of applying Metrohm 859 Titrotherm to your particular process analytical situation with your Metrohm technical representative.



Application examples: thermometric endpoint titration (TET) in alumina refining

Hydrometalurgical process:
analysis of Bayer Process liquor

The sodium aluminate liquors are routinely analyzed for their total caustic, carbonate and alumina contents. «Total caustic» is defined as the free hydroxyl ions plus those bound in aluminate, $Al(OH)^{4-}$. It may be expressed in terms of g/L Na_2O or Na_2CO_3. The carbonate content is also expressed in terms of Na_2O or Na_2CO_3. The alumina content is calculated from the analysis of aluminate, and is expressed in terms of g/L Al_2O_3. The thermometric titration procedure for all three analytes is at least twice as fast as Bayer liquor analysis by potentiometric titration, and offers similar precision and accuracy. Furthermore, the Thermoprobe sensor can be expected to have a much longer service life (Metrohm Application Notes AN H-026, AB 293).

Since carbonate levels do not vary significantly in the short term, many alumina refiners will find a method for only total caustic and alumina very useful. This unique thermometric titration procedure is completed in less than three minutes for analysis of concentrated liquors, essentially three to four times faster than the potentiometric procedure. The procedure is very robust, and could be considered for run-of-mine and borehole samples of bauxite or for use in online analysis. A separate procedure optimized for carbonate only has been developed, and can be run as required (Metrohm Application Note AN H-117).

Analysis of chloride in Bayer liquor

An aliquot of Bayer liquor is strongly acidified with nitric acid, and titrated with standard silver nitrate solution (Metrohm Application Note AN H-067).

References (on thermometric titration):

1. H. L. Watts and D. W. Utley, Anal. Chem. 28, 1731 (1956)
2. E. VanDalen and L. G. Ward, Anal. Chem. 45, 2248 (1973)

Process monitoring: analysis of acid cleaning solutions

Many alumina refineries use solutions of sulfuric acid containing an inhibitor to clean siliceous «desilication product» scale from heat exchangers in the digestion circuit. The acid is consumed during the cleaning cycle, and the solution requires monitoring to ensure effective cleaning by having an excess of free acid. The TET using sodium hydroxide as titrant is unaffected by the large quantities of silicic acid which accumulate in the solution during the cleaning cycle, and the free acid content is determined easily.

Another TET procedure has been developed to ensure that the passivation of the steel heat exchanger surfaces by the inhibitor is working effectively. A redox titration using dichromate determines the ferrous ion content of the solution, which is produced by acid attack on the iron heat exchanger tubes. These two methods ensure that the cleaning cycle is conducted efficiently and with minimum damage to the heat exchangers (Metrohm Application Notes AN H-012, AN H-079).

Titrimetric applications for waste management and control

These days, mining companies are subject to stringent environmental and rehabilitation codes in order to minimize their environmental footprint and avoid impacts on human health. The challenge largely consists in containing the large amounts of often toxic waste (slurries, e.g., red mud) that are produced during the various metallurgical processes in order to win the respective metals.

Metrohm offers various solutions enabling the mining industry to monitor contaminants in process solutions, slurries, and waste waters down to trace levels with utmost precision.

Standard addition:
determination of Cyanide in process water

The determination of the cyanide content in process water with is based on the standard addition method using an ion-selective cyanide electrode (cyanide ISE). An aliquot of sample is transferred from the to the measuring vessel and treated with TISAB solution (NaOH, 0,1 mol/L) as auxiliary reagent. The cyanide content of the water sample is calculated by the standard addition method from the potential measurements performed after each addition of cyanide standard solution.

Thermometric titration:
analysis of seawater neutralization of red mud residues

Alumina refineries located close to the sea can use the magnesium and calcium contained in seawater to neutralize caustic-laden red mud residues prior to discharge into storage areas. It is essential that an excess of magnesium should be present for full neutralization to be achieved. Metrohm has developed a rapid TET procedure for the sequential determination of calcium and magnesium in brines. TET procedures for the chloride and sodium contents of the brine solutions are also available (Metrohm Application Notes AN H-74, AN H-077, AN H-078).

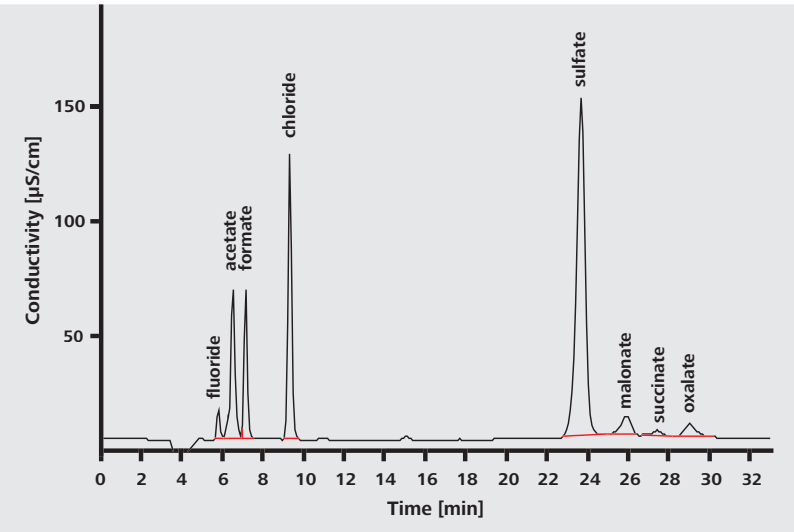
Ion Chromatography

Ion chromatography (IC) as an alternative ion analysis method to titration and voltammetry is applicable for the determination of anions, cations, organic acids, and polar substances in a wide range of concentrations (ng/L to %). The major benefit of IC is that chemically similar substances can be analyzed in a single run. In the mining branch IC is mostly used for environmental monitoring of waste water streams as well as for pollutants control during hydrometallurgic processes.

Anions in Bayer Liquor by ion chromatography

Determination of anions in Bayer Liquor is important as it can help in producing high-purity alumina at a faster rate. This is done by monitoring key impurities like oxalate and organic carbon which lower the purity and increase the time required to produce the alumina. The sulfate content corresponds to an increased corrosion in the final product. Besides titration also ion chromatography is used in this process for a multi component liquor analysis.

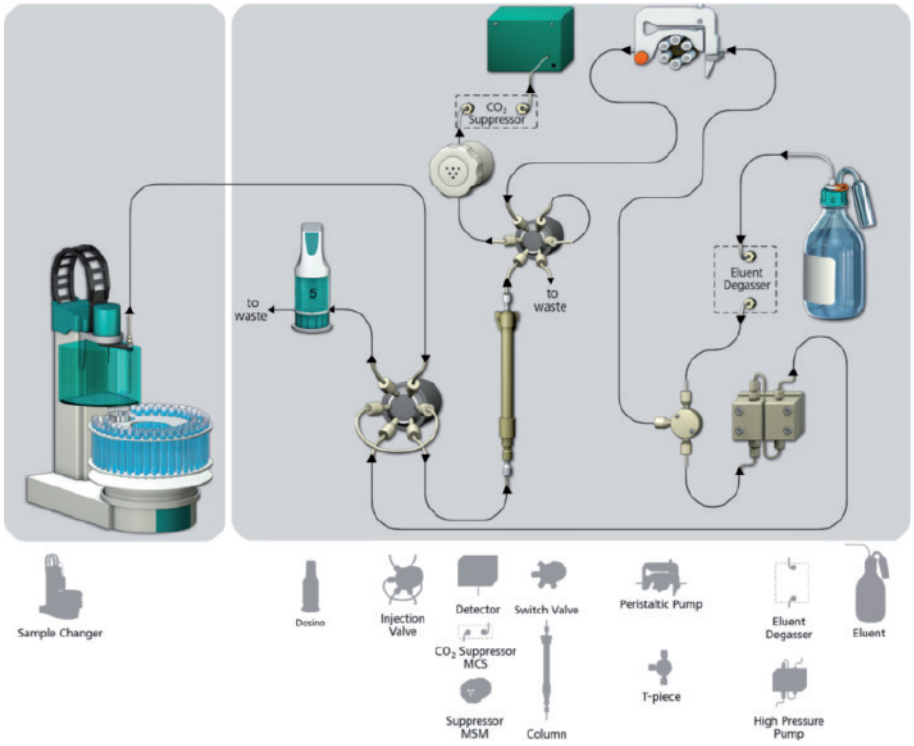
Ion chromatography with suppressed conductivity detection allows the determination of anions and organic acids like fluoride, chloride, sulfate, acetate, formate, malonate, succinate, and oxalate in a single run. The very robust Metrohm IC system provides for reliable and long-term stable analysis. Interferences of the very high pH and the aluminum matrix can be avoided by using Inline Neutralization or a unique suppressor cutting technique.



Anions in Bayer Liquor by ion chromatography: Column: Metrosep A Supp 7 - 250/4.0; eluent: 3.6 mmol/L sodium carbonate in 2% acetone; 0.8 mL/min; sample volume: 5 µL; dilution: 1:100; Inline Neutralization

The simultaneous separation of inorganic compounds (e.g. fluoride, chloride, sulfate), organic acids (e.g. acetate, formate, and other aluminium complexants (e.g. malonate, succinate, oxalate) in a Bayer Liquor sample shows the capability of ion chromatography. Shorter analysis times are also possible, if only a limited number of species has to be quantified (e.g. chloride, sulfate, oxalate analysis in less than 10 min).

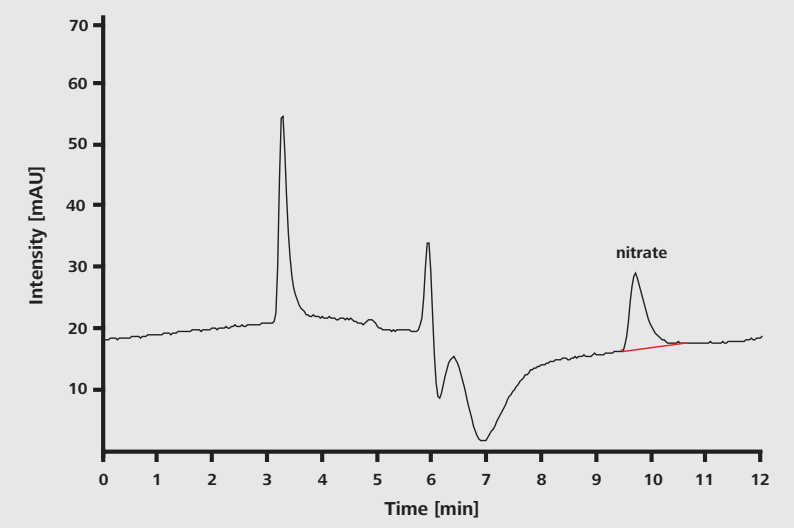
A unique suppressor cutting technique is also used for routine analysis of the anionic impurities in Bayer Liquor samples. This technique is very reliable, because the aluminium matrix never comes in touch with the chemical suppressor. When the matrix in the injection peak elutes from the column, the suppressor is switched off from the flow path and the matrix flows directly to the waste. After the injection peak the suppressor is switched in the flow path again and the anionic compounds can be detected with high sensitivity. Due to a continuous flow of eluent through the suppressor – also during the time of the injection peak – interferences in the baseline can be avoided and no equilibration time is necessary. Practical use has proven: a very robust setup!



Ion chromatography for ore analysis

Anions, cations, transition metals, organic acids or lanthanides can be determined by ion chromatography in ore extracts. This kind of analysis is used for process control or monitoring of cleaning procedures. Especially in anion chromatography there are two different ways to perform such applications:

a) non-suppressed chromatography with conductivity or UV/VIS detection or
b) suppressed conductivity detection with Inline Cation Removal.



Nitrate in cobalt and copper extracts by non-suppressed UV-detection: Column: Metrosep A Supp 1 - 250/4.6; eluent: 3.0 mmol/L sodium carbonate; 1.0 mL/min; sample volume: 20 µL; dilution: 1:100; sample amount: 1 g

For the determination of nitrate in cobalt and copper extracts non-suppressed UV detection is the best choice. The analysis is fast and robust. 100% spiking recoveries have proven that the nitrate analysis is independent from matrix effects. The example of nitrate determination in a cobalt ore extract is shown in the chromatogram above.

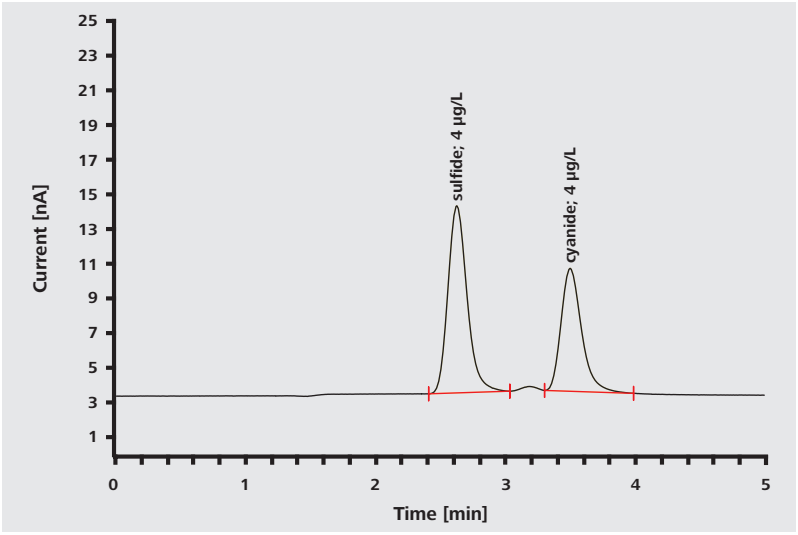
Ion chromatography for waste management and control

Cyanide in waste water

Cyanide in waste water samples can be determined by ion chromatography. For high concentration non-suppressed conductivity detection is applicable, but especially for low concentrations amperometric detection is the best solution. This technique allows the simultaneous analysis of cyanide and sulfide with detection limits in ng/L range.

Further applications

- Cation analysis in waste water (Metrohm Application Notes: AN C-14, AN C-133, AN C-135)
- Anion and organic acid analysis in process and waste water samples (AN S-107, AN S-133, AN S-249)
- Sulfide analysis in waste water by UV detection (AN U-38)
- Arsenite and Arsenate in process and waste water (AN U-44)



Fast, extremely sensitive (detection limits below 10 ng/L) and reliable determination of cyanide and sulfide is possible with DC amperometry. Analysis of a standard solution containing 4 µg/L cyanide and 4 µg/L sulfide; column: Metrosep A Supp 10 - 100/2.0; eluent: 100 mmol/L NaOH + 7 µmol/L EDTA, 0.25 mL/min; column temperature: 35 °C; detector: DC mode, WE: Ag, RE: Ag/AgCl, working potential: 0 V, temperature: 35 °C; sample volume: 20 µL

Voltammetry

Voltammetric trace analysis is used for determining electrochemically active substances. These can be inorganic or organic ions or even neutral organic compounds. Main application field are traces of transition metal ions in various matrices. Voltammetry is often used for supplementing and validating spectroscopic methods and is characterized by low equipment costs, comparably low investment and operating costs, short analysis times, and a high accuracy and sensitivity.

Voltammetry is suitable in particular for laboratories (as is the case in the mining industry), in which only a limited number of different parameters need to be controlled. Thus, it is often used for specific applications that are either not feasible or too costly using other techniques. Voltammetry can be used in the central analytical lab, but is also often installed in the plant for fast and efficient process control.

The 797 VA Computrace is a modern voltammetric measuring stand that allows voltammetric and polarographic determinations to be carried out. The analyses can also be easily automated by adding Dosinos and a sample changer. With the online VA analyzer ADI 2045VA even continous fully automatic control of the electroplating process is possible.

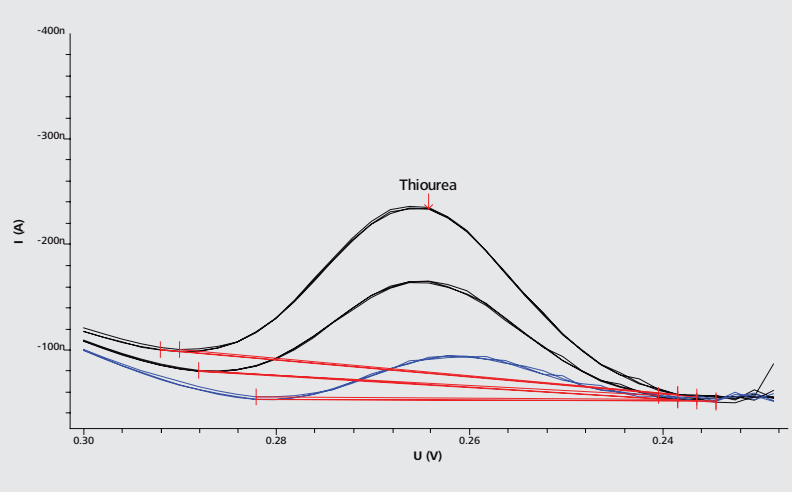
Determination of trace metal impurities in zinc plant electrolytes (zinc sulfate solutions in zinc electrodeposition)

In the production of zinc the metal is deposited electrolytically on a cathode. The zinc electrolyte used contains heavy metal impurities coming from the processed zinc ore. Using voltammetry it is possible to determine even low traces of these heavy metals in the electrolyte reliably and, as a result, minimize interferences of the metal deposition in the electroplating process with the required precision.

Analyte	Metrohm Application Note
Antimony	V-078
Antimony(III)	V-175
Arsenic	V-174
Cadmium	V-015
Cobalt	V-172
Copper	V-105
Germanium	V-111
Lead	V-173
Nickel	V-077
Selenium	V-170
Tellurium	V-171
Thallium	V-105

Thiourea in copper electrolytes in copper electrorefining plants (AN-V-200)

Copper is refined using an electrolysis procedure where raw copper anodes are dissolved in a copper sulfate solution and redeposited on the cathode as high-purity copper. Thiourea is added to the copper electrolyte to optimize plating efficiency. With voltammetry, thiourea can easily be determined in highly concentrated copper electrolyte solutions containing sulfuric acid and small amounts of chloride.



Heavy metals in effluents

Effluents from mining and metal production processes have to be treated to remove toxic metal ions and other substances before released to the environment. Voltammetric determination of many heavy metals is also possible in the effluents. If organics are remaining in the sample it is mineralized by means of UV digestion in the 909 UV Digester.

On-line process monitoring

For the mining industry, continuous control of the production process, the quality of the product, and the composition of any waste streams is of utmost importance. With the on-line process analyzers from Metrohm Applikon this is possible 24 hours a day, 7 days a week. Metrohm Applikon on-line analyzers are used directly on-site, as close as possible to the process, and run completely stand-alone without any operator intervention required.

Metrohm Applikon analyzers are based on wet-chemical analysis techniques such as titration, photometry, or ion-selective electrode measurements. Analyzers are available for single method, single-stream purposes as well as for multiple methods in multiple sample streams.

Sampling

In on-line analysis, sampling and sample preconditioning are at least as important as the analyzer itself. Metrohm Applikon has a lot of expertise in this area and offers custom-made sampling systems, for example, for pressure reduction, blow back filtering, and settlers for solid separation.

All Metrohm Applikon analyzers are equipped with possibilities for discrete digital I/O as well as analog outputs. Results, for example, can be transferred via 4...20 mA outputs, whereas alarms and analyzer status can be transmitted via digital outputs. Digital inputs, in turn, can be used for remote start-stop and sample override purposes. The option is now available for data communication by ModBus/Web Service over ethernet for a complete industrial protocol package.

The ADI 2045TI represents the latest generation of wet chemical analyzers. Its modular wet part gives the ADI 2045TI flexibility to adapt it to any specific application.

Application examples

Hydrometallurgical process:
free & WAD cyanide in a gold leach slurry

In gold mining, cyanidation (cyanide leaching) is a major chemical step to extract gold from low grade ore as part of the CIP/CIL plant circuit and gold recovery process. Leaching reagent in the form of cyanide is added to the leach reactors. In order to achieve effective leaching prior to carbon adsorption, cyanide concentrations must be maintained at minimum levels (up to 300 mg/l).

The ADI 2045TI is configured to sample from multiple leach tanks by the classical precipitation titration method with silver nitrate. The near continuous free cyanide measurement manages the cyanide profile throughout the leach circuit and reduces cyanide consumption without compromising gold recovery. The accurate results obtained from the analyzer are relied on for automatic chemical replenishment of the cyanide to the leach tanks. This on-line process control also ensures a reduction of cyanide concentration in the mill tailings.

A more recent requirement is to measure WAD Cyanide (weak acid dissociable metal-cyanide complexes) in addition to Free Cyanide. This gives an immediate indication of the WAD metals being processed to further optimize the cyanidation process. WAD readings will also be an early indication for the detoxification plant to optimize the cyanide destruction process coupled with automatic dosage of the cyanide detoxification reagents.

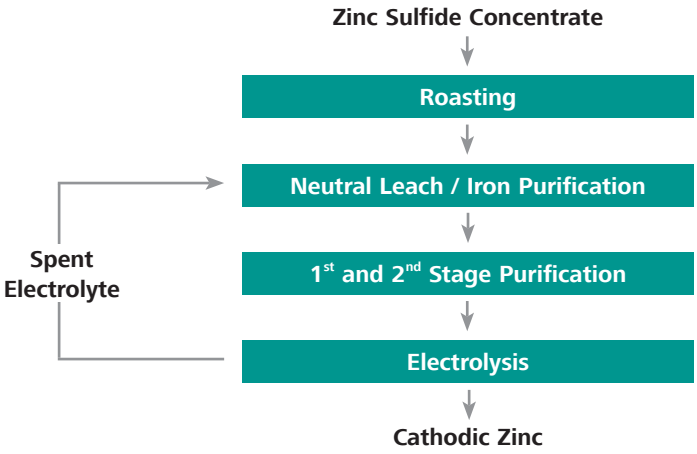
The ADI 245TI is especially equipped with a digester and cuvette module to digest the sample at 80 °C for 20 minutes and color measurement at 510 nm using picric acid as colour complex. Typical measuring range is 0-50 mg/l.

24/7 waste/discharge monitoring

The ADI 2045TI modular and versatile analyzer can be installed downstream for environmental monitoring requirements for either Free Cyanide, WAD Cyanide or TCN or a combination of two measurements depending on the plant discharge regulations.

Zinc, sulfuric acid and iron in metallic zinc production

Most electrolytic zinc plants roast (roasting stage) a concentrate of the zinc sulfide ore followed by the neutral leach and iron purification stages. It is here that the ADI 2045TI comes into play as an important analytical tool. Sulfuric acid (spent electrolyte) from the cell room dissolves zinc oxide to form zinc sulfate and water. The acid is first measured for the proper starting concentration and then measured again in the hot acid leach or neutral leach as it is consumed by neutralization. A simple pH titration with a glass electrode and sodium hydroxide reports the acid concentration for control and replenishment. Zinc measurement by complexometric titration with EDTA using a Cu ISE satisfies the zinc sulfate completion rate monitoring.



Basic flow diagram describing the process for the electrolytic production of zinc

The iron purification stage involves purification of the impure zinc sulfate solution by precipitation of ferric sulfate. Here ferric iron is measured by titration against a platinum electrode with sodium thiosulfate to control the partial removal of arsenic, antimony and germanium prior to first and second stage purification that follows.

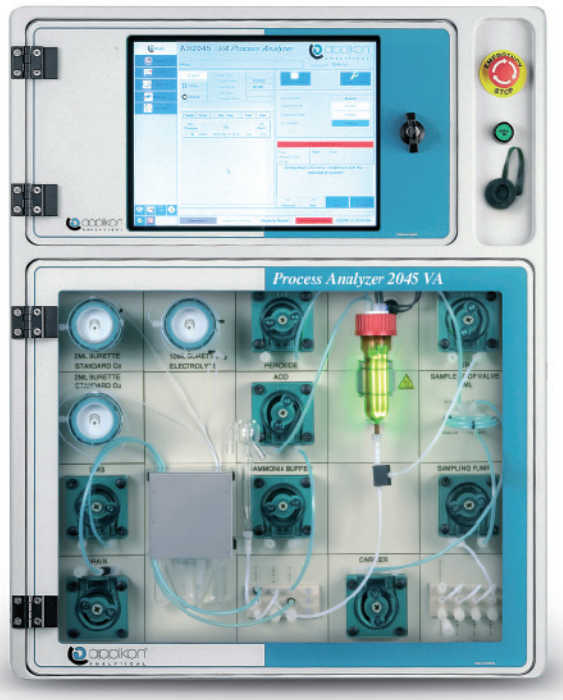
First and second stage purification are the final modes of purification prior to the electrolyte solution entering the cell room as purified neutral zinc sulfate. Purification is carried out by zinc dust precipitation or cementation. Here trace elements called impurities (Ni, Co, Cu, Cd, Sb, Ge) need to be monitored and controlled to meet stringent low limits. Impurities that co-deposit with zinc downgrade the purity of the zinc metal. If the purity of the filtered electrolyte solution is not within the prescribed limits the batch is returned to second stage purification for further treatment.

The ADI 2045VA, a sister product of the ADI 2045TI, is specially designed for voltammetric analysis of the mentioned trace metal impurities using the Multi-Mode Electrode pro. With the impurities in check the final electrowinning process in the electrolytic production of zinc is further optimized.

The ADI 2045VA is also used for the environmental monitoring of trace metals in a zinc plant effluent.

Summary of other mining applications using an ADI 2045TI/2045VA

Production	Part of process	Application	Method
Copper mining	Electrolyte tanks	Chloride in copper electrolyte solution	Precipitation titration
	Copper leach tank farm	Copper, iron in slurry streams	Complexometric & redox titration
	Solvent extraction	Copper, iron, cobalt, manganese & acid	Complexometric, redox titration, photometry & potentiometric titration
Manganese	SO_2 absorption into feed electrowinning	SO_2 in electrolyte solution	Potentiometric titration
	Leaching, thickening & purification	SiO_2 in ammonium sulfate	Photometry
Nickel refinery	Matte leach plant	Nickel, copper, iron & acid	Complexometric, redox & potentiometric titration
	PN feed to WWTP (waste water treatment plant)	Chrome, hydrochloric & manganese	Photometry, titration
	Nickel purification	Cobalt, zinc, nickel, copper	Voltammetry
Platinum refinery	Base metal refineries	Acid, pH & redox	Titration, direct measurement
	Acid liquors	Molar ratio (Ni/NH_3)	Potentiometric titration
Uranium	Uranium extraction – yellow cake process	Free acid (HNO_3) in process	Potentiometric titration



The ADI 2045VA is an on-line analyzer focusing on voltammetric analysis. The ADI 2045VA is built in the same housing as the well-known and proven ADI 2045TI multi-purpose analyzer. Its analytical heart is the 797 VA Computrace system from Metrohm, the most popular laboratory VA system.

Service you can rely on – Metrohm Quality Service

Reliable results for the lifetime of your analytical instruments

Whoever is responsible in the laboratory for the accuracy of the results must not make compromises. Fortunately, systems installed and maintained by professionals on a regular basis all but eliminate the threats of instrument failure and lost profits.

Relying on the Metrohm Quality Service gives you peace of mind from the very start. From the professional installation of your instruments to regular maintenance care and – should a failure ever occur – instant quality repairs, we do everything to make sure that you can rely 100% on results produced during the entire lifetime of your Metrohm instruments.

Metrohm Compliance Service

Benefit from the Metrohm Compliance Service when it comes to the professional initial qualification of your analytical instruments. Installation Qualification/Operational Qualification carried out by our experts saves you time and money, as your analytical system is configured according to your needs and put into operation fast and reliably.

Initial instructions and user trainings ensure error-free operation of your new instruments by your staff. The Metrohm Compliance Service includes comprehensive documentation and guarantees compliance with the standards of quality management systems such as GLP/GMP and ISO.

Metrohm
Quality Service

Metrohm Quality Service

Metrohm Quality Service is available worldwide. Preventive maintenance carried out on a regular basis extends your instrument's lifetime while providing for trouble-free operation. All maintenance work done under the label Metrohm Quality Service is carried out by our own certified service engineers. You can choose the service contract that suits you best.

With a full service contract, for example, you can rely on the optimum performance of your Metrohm instruments, incur no additional costs and benefit from complete and compliant verification documents. Thanks to our service you are perfectly prepared for audits.

Our Services	Benefit for the Customer
Metrohm Care Contracts that, depending on contract type, include preventive maintenance, instrument certification, on-site repair, free or discount on spare sparts and consumables as well as guaranteed response times.	Cost certainty and cost savings, coverage of repair risk, quick response times and rapid problem solving, minimal downtimes, and ideal preparation for audits
Application support by means of our vast selection of Application Bulletins, Applications Notes, monographs, validation brochures, technical posters, and articles Personal consultation by our specialists per telephone or e-mail	Quick and professional solution to all arising application questions and complex analytical challenges
Training courses	Competent users contribute substantially to reliable results
Certified calibrations, for example, of dosing and exchange units	Accurate measurements Verification documentation for compliance with regulations and for efficient audits
Remote maintenance	Expeditious resolution of software questions
Back-up support	High data security
Emergency service, for example, express on-site repairs	Short response times and thus, rapid problem resolution Minimization of downtime
Original spare parts, made in Switzerland and available world wide Guaranteed spare parts available for at least 10 years beyond instrument discontinuation date	Lasting, successful repair; short delivery times Minimization of downtime Protection of your investment through long-term availability of spare parts and accessories
Decentralized repair workshops located around the world and a central workshop in Switzerland	Quality repairs done quickly, so your instruments are ready for use again

Ordering information

Ion Chromatography

Anions in Bayer Liquor samples

a) IC with Inline Neutralization

2.850.2190	850 Professional IC Anion – MCS – Prep 3
2.850.9010	IC Conductivity Detector
2.858.0030	858 Professional Sample Processor with Pump and Valve
6.1006.630	Metrosep A Supp 7 - 250/4.0
6.6059.242	MagIC Net™ 2.4 Professional

b) IC with suppressor cutting technique

2.850.2030	850 Professional IC Anion – MCS
2.850.9010	IC Conductivity Detector
2.872.0050	Extension Module Sample Prep
2.858.0010	858 Professional Sample Processor
2.800.0010	800 Dosino
6.1020.050	Metrosep A Supp 10 - 50/4.0
6.3032.210	Dosing Unit 10 mL
6.6059.242	MagIC Net™ 2.4 Professional

Anions in ore extracts

2.881.0010	881 Compact IC pro
2.887.0010	887 Professional UV/VIS Detector
2.919.0020	919 IC Autosampler plus
6.1005.300	Metrosep A Supp 1 - 250/4.6
6.6059.241	MagIC Net™ 2.4 Compact

Cyanide in waste water

2.881.0010	881 Compact IC pro
2.850.9110	IC Amperometric Detector
2.858.0020	858 Professional Sample Processor with Pump
6.5337.020	IC equipment Wall-Jet cell for cyanide analysis
6.1020.210	Metrosep A Supp 10 - 100/2.0
6.6059.241	MagIC Net™ 2.4 Compact

Voltammetry

2.797.0010	797 VA Computrace (for manual operation)
MVA-2	VA Computrace System with automated standard addition. Consists of 797 VA Computrace plus two 800 Dosinos.
MVA-3	Fully automated VA Computrace System. Consists of 797 VA Computrace with 863 Compact VA Autosampler and two 800 Dosinos for automated addition of auxiliary solutions. Enables the fully automated analysis of up to 18 samples. This system is a highly suitable solution for analyzing smaller sample series.
2.909.0014	909 UV Digester for the digestion of water samples with low to medium load of organic matter.

Thermometric Titration

2.859.1010 859 Titrotherm complete with ***tiamo***™ light
6.9011.040 Thermoprobe HF resistant

Potentiometric Titration

2.905.0010 905 Titrando with one measuring interface
2.905.0020 905 Titrando with two measuring interfaces
2.801.0040 801 Magnetic stirrer with support
2.800.0010 800 Dosino

6.3032.120 Dosing Unit 2 mL
6.3032.150 Dosing Unit 5 mL
6.3032.210 Dosing Unit 10 mL
6.3032.220 Dosing Unit 20 mL
6.3032.250 Dosing Unit 50 mL

6.0258.600 Unitrode with Pt 1000 temperature sensor with plug-in head U
6.0430.100 Ag Titrode for precipitation titrations with $AgNO_3$, plug-in head G
6.0431.100 Pt Titrode for redox titrations, plug-in head G
6.1115.000 Optrode for photometric titrations
6.2104.020 Electrode cable 1 m, plug-in head G
6.2104.600 Electrode cable 1 m, plug-in head U

Automation

Metrohm offers several options for sample processors and automated sample preparation. Please contact your local Metrohm distributor for further details.