Maden Sektöründe Cevher Analizinin Önemi

Sunum: Erdem Özdil
Müşteri Destek Müdürü/Kimyager
RedoksLab (2011)

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Ankara
- İstanbul
- İzmir
- Adana

RedoksLAB 1998 yılında kurulmuştur.

Thermo Fisher Scientific Analitik Cihazları Temsilcisidir(2008).

Enstrümantel Kromatografi ve Spektroskopi Cihazlarının ;

Satış ve Servisinde faaliyet göstermektedir.

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Type	Public
Traded as	NYSE: TMO S&P 100 component S&P 500 component
Industry	Laboratory equipment, biotechnology, pharmaceutical, healthcare
Founded	1956[1]
Headquarters	Waltham, Massachusetts, U.S.
Area served	Worldwide
Key people	Marc N. Casper (President & CEO) Mark Stevenson (COO) Ryan Snyder (CIO)
Products	Analytical/other equipment and instruments, laboratory reagents and consumables, science software and services —for research, discovery, analysis, and manufacturing (incl. pharmaceutical and diagnostic products)
Revenue	▲ US$39.21 billion (2021)[1]
Operating income	▲ US$10.03 billion (2021)[1]
Net income	▲ US$7.73 billion (2021)[1]
Total assets	▲ US$95.12 billion (2021)[1]
Total equity	▲ US$40.79 billion (2021)[1]
Number of employees	c. 130,000 (Dec 2021)[1]

Thermo Fisher Scientific Inc., bilimsel enstrümantel cihazlar, reaktifler ve sarf malzemeleri ve yazılım hizmetleri konusunda Amerikalı bir tedarikçidir.

Merkezi Waltham, Massachusetts'te bulunan 2017 itibariyle, şirketin değeri 21 milyar dolarlık ve bir Fortune 500 şirketi. 2021 yılında yıllık gelir 39,21 milyar ABD doları.

130.000'den fazla çalışanıyla hizmet vermektedir.

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Maden Sektöründe Cevher Analizinin Önemi

- **Maden sektöründe cevher analizleri, arama ve değerlendirme aşamasında projenin başarılı bir şekilde karlı bir madene dönüştürülmesinde çok önemli bir bileşendir.**

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Maden Sektöründe Cevher Analizinin Önemi

- Mineraller, kristal bir yapıya ve belirli bir kimyasal formül aralığına sahip, doğal olarak oluşan inorganik katılardır.

- Cevherler, kullanım için ekonomik olarak çıkarılabilecek kadar yüksek, kayadaki mineral konsantrasyonlarıdır.

- Tüm cevherler mineraldir, ancak tüm mineraller mutlaka cevher değildir.

- Bir cevher yatağında, yararlı mineral ile birlikte, kil, taş ve diğer yararsız silikatlar gibi mineraller de bir arada bulunmaktadır.

- Bu bakımdan gelişmiş laboratuvarlarda yapılan cevher analizleri, cevherin işlenebilir ve verimli olup olmadığını belirlemek açısından büyük önem taşımaktadır.

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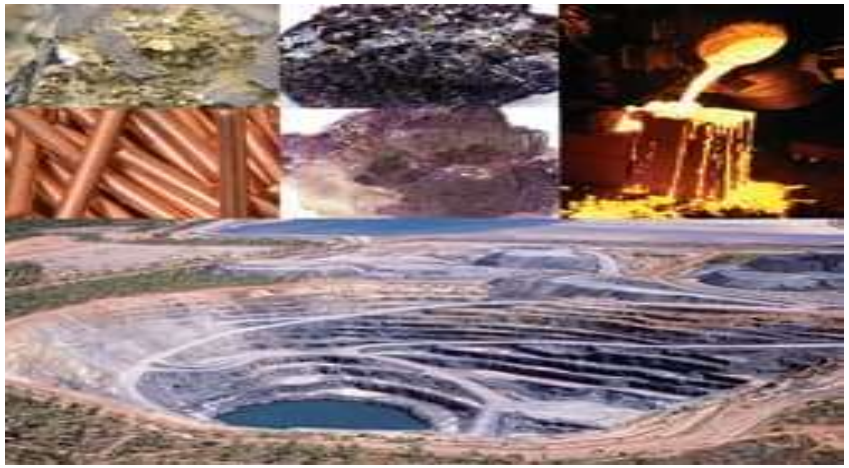
Maden Sektöründe Cevher Analizinin Önemi

Cevher Analizi	Yapılan Elementler
Demir	Aluminyum
Krom	Nikel
Mangan	Kalay
Bakır	Altın
Kurşun	Gümüş
Çinko	Boron



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Değerli maden arama ve işleme projelerinde de maden testleri büyük önem taşımaktadır. Kimyasal testler ile maden arama, çıkarma ve işleme faaliyetlerinde olası riskler azaltılmakta ve yatırımın güvenilir olması sağlanmaktadır.

Geri kazanımlar ne kadar yüksek olursa, yani işleme sırasında cevherden çıkarılan değerli metalin yüzdesi ne kadar fazla olursa, işletmenin kâr marjı da o kadar yüksek olur ve yatırımların geri dönüşleri de o kadar hızlı olur.

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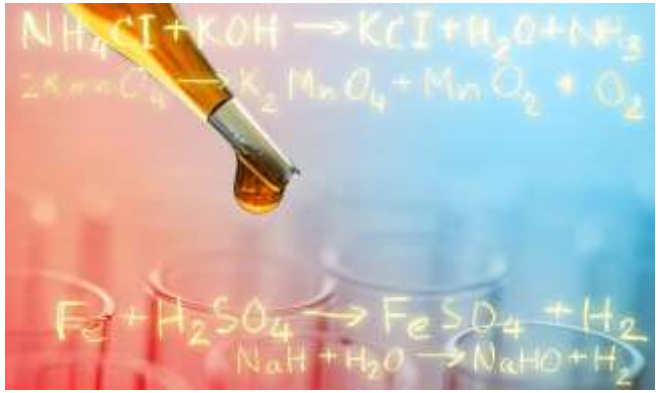
Maden Sektöründe Cevher Analizinin Önemi

Maden testleri, arama ve değerlendirme aşamasında projenin başarılı bir şekilde karlı bir madene dönüştürülmesinde çok önemli bir bileşendir.



Maden testleri ile çıkarılacak madenin durumu ve bileşimi değerlendirilir ve ticari düzeyde ekstraksiyon ve işlemenin ekonomik olarak uygun olup olmayacağına karar verilir.

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Maden Sektöründe Cevher Analizinin Önemi

Herhangi bir kimyasal analize başlamadan önce dikkat edilmesi gereken en önemli dört unsur şu şekildedir:

- **Analiz edilmesi umulan elementler nelerdir?**
- **Bu elementlerin özellikleri, yani atom ağırlığı ve atom numarası nedir?**
- **Ele alınan elementlerin konsantrasyonları (ağırlık yüzdesi, ppt, ppb veya ppm değerleri) nelerdir?**
- **Hangi mineraller veya mineral fazları belli elementler ile ilişkilidir?**

Sample Requirements Criteria

Criteria	Flame AA	GFAA	ICP-OES	ICP-MS
Measurement Range				
high > 10%			X	
1 - 10 %	X		X	
ppm	X		X	X
high ppb	X	X	X	X
low ppb		X	X	X
ppt		X		X
Number of samples				
Few	X	X		
Several	X		X	X
Many			X	X
No Elements per Sample				
Single	X	X	X	X
Few (2-5)	X		X	X
Intermediate (5-10)			X	X
Many			X	X
Sample Matrix				
< 3%	X	X	X	X
3-10 %	X	X	X	
> 10%		X	X	

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- Atomik Absorpsiyon Spektometri
- (0.1 ppm-1000ppm)

ICP-OES

- İndüktif Eşleşmiş Plazma-Optik Emisyon Spektrometresi
- (1ppb-10000ppm)

ICP-MS

- İndüktif Eşleşmiş Plazma-Kütle Spektrometresi
- (0.1ppt-1000ppm)

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AAS

AAS cihazı ;Cevher analizlerinde en çok kullanılan ve tekli analiz yapan alevli atomik absorpsiyon yöntemidir.

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APPLICATION NOTE 43181

The analysis of gold using the Thermo Scientific iCE 3000 Series Atomic Absorption Spectrometers

Authors
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Bremen, Germany

Keywords
Cyanide leach, Fire Assay, Flame Atomic Absorption, Gold

Introduction

Gold is a brilliant and beautiful metal, often associated with wealth, power and luxury. It is malleable and ductile, highly resistant to corrosion and tarnishing and sought after around the globe. Its uses range from jewellery and decoration, to storage of monetary value, to dentistry. It can also be found in food, electronics, and medicine.

Gold mining is the process of removing gold from the ground or streams, followed by multiple processing and extraction stages to obtain the final desired product. Due to its importance and high value, gold prospectors and metallurgists need to accurately determine the concentration of gold in mined samples. As geological samples are typically not homogenous, drying, grinding and pulverizing of samples is required before dissolution and analysis. Analysts require rapid and robust analytical methods on instrumentation capable of handling high levels of dissolved solids, yet providing high sensitivity, accuracy and stability. Flame atomic absorption spectrometry is the ideal technique to meet these analytical needs. This application note presents two methods for analysing gold. The first uses an aqua regia sample digestion method, while the second follows a cyanide leach protocol. Quality Control checks are used to ensure the long term stability of each method.

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ICP-OES

ICP-OES cihazı ;Cevherde çoklu element analizlerinde cevherin ana elementlerinin dışında değerli metalleri ile birlikte Nadir Toprak elementleri (REE) de analiz edilebilmektedir.

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APPLICATION NOTE 44430

Analysis of platinum group elements with the Thermo Scientific iCAP PRO Series ICP-OES

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Keywords
Catalyst, Electronics, Jewelry, Metallurgy, Microwave digestion, PGE, Platinum group elements

Goal
To demonstrate the ability of the Thermo Scientific iCAP PRO XP ICP-OES to perform analysis of Platinum Group Element (PGE) analytes in high concentration metal matrices with excellent accuracy, where traditionally a radial instrument would be used.

Introduction
The platinum group elements, or PGEs as they are sometimes referred to, are a collective of metals grouped together in the middle of the periodic table. The six elements normally included in the group are all transition metals with some similar chemical and physical properties. Generally, this group is assumed to include platinum, palladium, rhodium, iridium, ruthenium and osmium (see Figure 1); all have become valuable and extremely useful to industry (and civilization in general) because of their elemental properties, rarity and beauty.

A wide range of PGE alloy compositions are used in electronic applications such as low voltage and low-energy contacts, thermocouples, furnace components and electrodes. The chemical and petrochemical industries use the PGEs' extraordinary catalytic properties in a wide range of processes including refining crude oil to produce many synthetic organic chemicals.[1]

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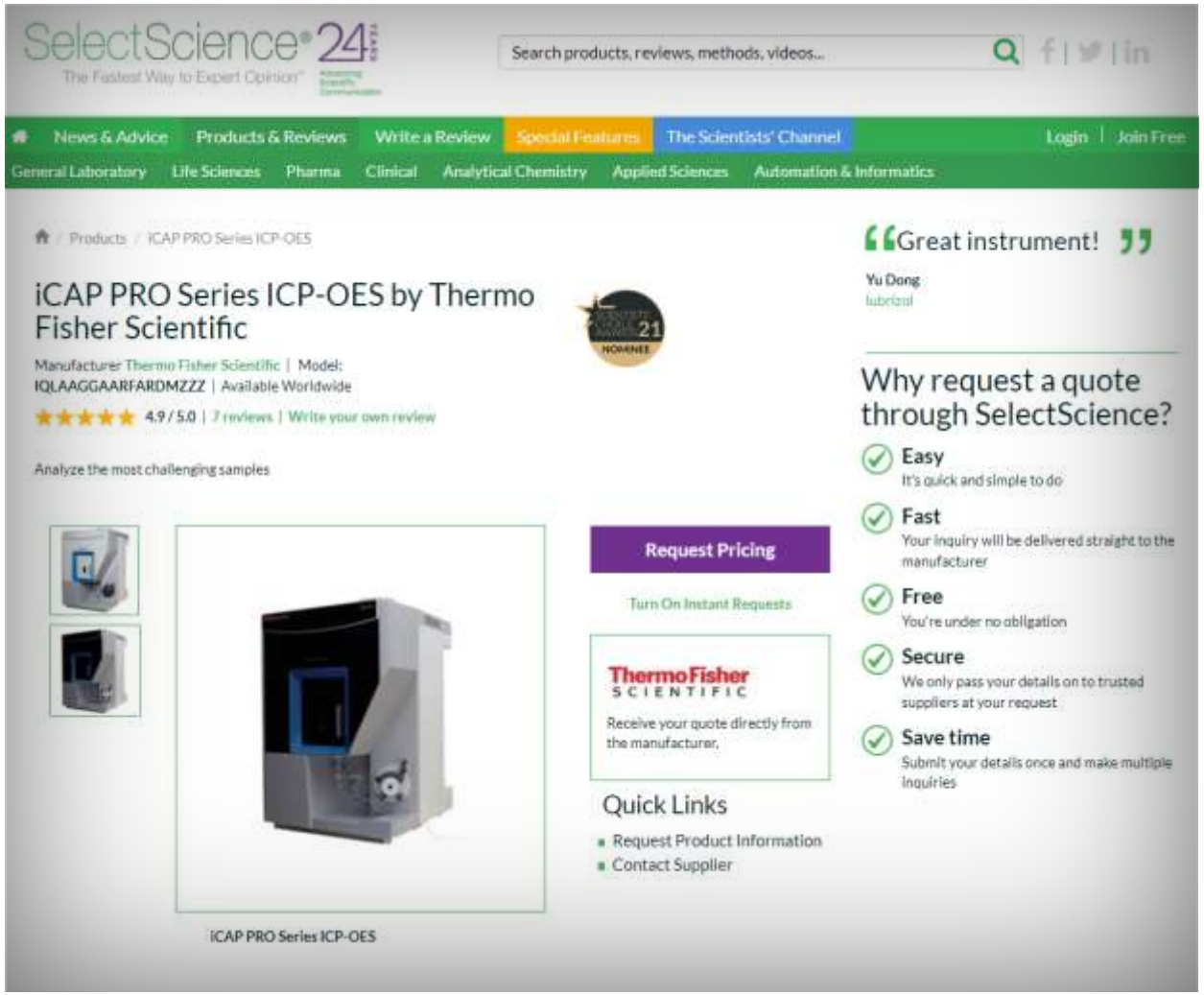

SelectScience tarafından; iCAP PRO Serisi ICP-OES cihazı **«Best New Spectroscopy Product of 2020» olarak bilim adamları tarafından seçilmiştir.**

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ICP-MS

ICP-MS Cihazı ;

- Eser elementleri,
- Altın(Au),
- Gümüş(Ag),
- Platin grubu elementler (PGE) ve Nadir Toprak Elementlerini(REE) düşük konsantrasyonlarda ppt seviyelerinde analiz edebilmektedir.

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APPLICATION NOTE 44365

Effective removal of isobaric interferences on strontium and lead using triple quadrupole ICP-MS

Authors
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Simon Lofthouse,
Simon Nelms and
Shona McSheehy Ducos

Keywords
Isobaric interferences,
Kinetic energy discrimination,
Reaction gas,
Single quadrupole ICP-MS,
Triple quadrupole ICP-MS

Goal
To show the complete removal of isobaric interferences such as ^{87}Rb on ^{87}Sr, or ^{204}Hg on ^{204}Pb utilizing the Thermo Scientific iCAP TQ ICP-MS.

Introduction
Unresolved spectral interferences may lead to biased results in ICP-MS. Single quadrupole ICP-MS typically uses a comprehensive interference removal mechanism with an inert collision gas (helium) and kinetic energy discrimination (KED). This approach, is based on the difference in size between an analyte and polyatomic interference and as such is effective for removal of many common interferences. In some cases though, two elements may share isotopes with identical mass number. These isotope overlaps are commonly referred to in ICP-MS as isobaric interferences. As the elemental ions are of a similar size, KED is not able to resolve these interferences. In addition, as the difference in mass between overlapping isotopes is extremely low, they cannot be spatially resolved using either quadrupole based or high resolution ICP-MS. Often, correction of isobaric interferences is accomplished using mathematical methods, however this procedure may lead to increased measurement uncertainties. Isobaric interferences may be resolved using reactive gases (e.g. O_2 or NH_3), in the cases where one element forms a different product ion to the other. However, side reactions may create new unwanted interferences with other ions extracted from a sample, so that full interference removal may not be possible.

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Laser Induced Breakdown Spectroscopy (LIBS)
numune yüzeyinde bir mikro plazma oluşturmak için kısa bir lazer darbesi kullanan hızlı bir kimyasal analiz teknolojisidir. Bu analitik teknik, diğer elementel analiz tekniklerine kıyasla birçok zorlayıcı avantaj sunar. Bunlar şunları içerir:

Numune hazırlama gerektirmeyen bir ölçüm deneyimi
Tek bir nokta analizi için genellikle birkaç saniye gibi son derece hızlı ölçüm süresi
H, Be, Li, C, N, O, Na ve Mg gibi daha hafif elementler dahil olmak üzere geniş element analizi
Örnek yüzeyinin hızlı taramasını ve derinlik profili oluşturmayı içeren çok yönlü örnekleme yapılabilmektedir.
Alt tabaka girişimi endişesi olmadan ince numune analizi

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Chemical Imaging of Ruby-in-Zoisite Gem Rock Using J200 LIBS Instrument

Elemental mapping for ruby-in-zoisite gem rock using Applied Spectra's J200 LIBS Instrument demonstrates how LIBS, with the ability to measure lighter and organic elements, is a highly complementary elemental imaging technique for XRF/XRD, electron microprobe, and LA-ICP-MS.

Geochemical Fingerprinting of Coltan Minerals Using LIBS

LIBS spectra contains rich composition information that can help analysts identify the origin or source of geological samples. Read this application note to discover how Applied Spectra's J200 LIBS Instrument identifies coltan mineral ores important for electronic manufacturing from conflict zones.

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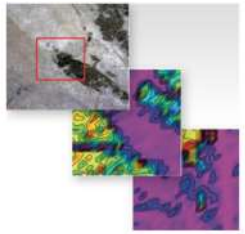
Rapid Lead (Pb) Analysis of Thin Solder Plating on Semiconductor Leadframes Using LIBS

Read this application note to understand how powerful the J200 LIBS Instrument is for sensitive micro-analysis of electronic components and how LIBS compares with traditional elemental analysis techniques such as XRF and ICP-OES.



Innovative Elemental Mapping of Geological Minerals with Applied Spectra's J200 Tandem LA-LIBS

To understand the capabilities of the J200 Tandem LA – LIBS instrument in combination with ICP-MS, a rare earth element (REE)-rich mineral was analyzed and the elemental composition over a 16 mm^2 area was mapped using contour plots.

Rapid Analysis of Mining Samples Using Laser Induced Breakdown Spectroscopy (LIBS)

Laser-induced breakdown spectroscopy (LIBS) offers many attractive analytical advantages with respect to other techniques for the mining industry. LIBS can detect elements from H – Pu, which includes non-metals, such as H, N, F, and O, along with high sensitivity for lighter elements (B, Li, C, K, Ca, Mg, Al, Si, etc.)

Rapid Composition Monitoring of Raw Li-ion Battery Electrode Materials Using the J200 LIBS Instrument

Laser Induced Breakdown Spectroscopy (LIBS) provides real-time analysis of the raw materials for the Li-ion battery electrode in both powder and pressed pellet form.

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AAS/ICP/ICP-MS ve yaş kimya analizlerinde laboratuvarda kullanılan standartlarının temsilciliğini yapmaktayız.

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DETAYLI BİLGİ İÇİN SİZLERİ STANDIMIZA BEKLİYORUZ.

TEŞEKKÜRLER

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