IMPROVING THE QUALITY OF FORENSIC TRACE EVIDENCE

ECCO®2

ELEMENTAL COMPARATOR

FOR THE ELEMENTAL ANALYSIS OF EVIDENCE BY LASER INDUCED BREAKDOWN SPECTROSCOPY

A compact and versatile forensic laboratory instrument, the ECCO®2 Laser Induced Breakdown Spectrometer (LIBS) is an ideal tool for the comparison and identification of Glasses, Papers, Inks, Drugs, Soil, Explosives, and other valuable traces of evidence.

Using ECCO®, forensic examiners can quickly identify the presence of more than 90 different elements down to concentrations of low PPM.

LIBS requires minimal sample preparation and provides spectra in a matter seconds, making the technique a rapid, relatively low cost, and highly effective alternative to more common analytical tools such as SEM-EDS and LA-ICP-MS.

foster+freeman

ECCO®2 ELEMENTAL COMPARATOR

A TURNKEY SYSTEM FOR THE ELEMENTAL ANALYSIS OF FORENSIC EVIDENCE BY LASER INDUCED BREAKDOWN SPECTROSCOPY(LIBS).

LIBS is a versatile analytical technique which offers significant advantages in speed, sensitivity and cost effectiveness over other processes such as XRF, SEM, and mass spectrometry.

Having placed an item of evidence into the ECCO®2 sample chamber, a high intensity pulsed laser is focussed on the sample creating a tiny plasma of vaporised matter which emits an atomic spectrum of the constituent elements of the sample providing a material "fingerprint". Within seconds, this fingerprint is compared against the ECCO®2 database of emission lines to provide automatic identification and labelling of all elements present within the sample.

LIBS analysis with ECCO®2 is fast, simple to operate, requires minimal sample preparation, gives immediate results of the elements and is sensitive to low parts per million.

Features include:

- Automatic identification of elements
- Comprehensive library of element emission lines
- Comparative display of spectra and peak ratios
- Relative measurement of element concentrations
- Air Cooled Q-switched Nd:YAG 1064nm laser
- Integral sample selection camera with digital zoom
- XYZ sample positioning/focusing stage
- Interlock sample chamber with full laser safety features
- Forensic casework management system

LIBS Detectable Elements

Analysis by LIBS can (in principle) detect *all* elements and is limited only by the specification of the laser and spectrometer hardware.

Equipped with a powerful 1064nm laser and a highly sensitive spectrometer/gated detector system, ECCO®2 is capable of detecting all elements of forensic interest, including common elements, rare earth metals, and light elements.

H Hydrogen																	He Helium
Li Lithium	Be Beryllium											B Boron	C Carbon	N Nitrogen	O Oxygen	F Fluorine	Ne Neon
Na Sodium	Mg Magnesium											Ai Aluminium	Si Silicon	P Phosphorous	S Sulphur	Cl Chlorine	Ar Argon
K Potassium	Ca Calcium	Sc Scandium	Ti Titanium	V Vanadium	Cr Chromium	Mn Manganese	Fe Iron	Co Cobalt	Ni Nickel	Cu Copper	Zn Zinc	Ga Galium	Ge Geremanium	As Arsenic	Se Selenium	Br Bromine	Kr Krypton
Rb Rubidium	Sr Stronium	Y Yttrium	Zr Zirconium	Nb Niobium	Mo Molybdenum	Te Technetium	Ru Ruthenium	Rh Rhodium	Pd Palladium	Ag Silver	Cd Cadminium	In Indium	Sn Tin	Sb Antimoney	Te Tellurium	I Iodine	Xe Xenon
Cs Caesium	Ba Barium		Hf Hafnium	Ta Tantalum	W Tungsten	Re Rhenium	Os Osminium	Ir Iridium	Pt Platinum	Au Gold	Hg Mercury	Tl Thallium	Pb Lead	Bi Bismuth	Po Polonium	At Astatine	Rn Radon
Fr francium	Ra Radium																

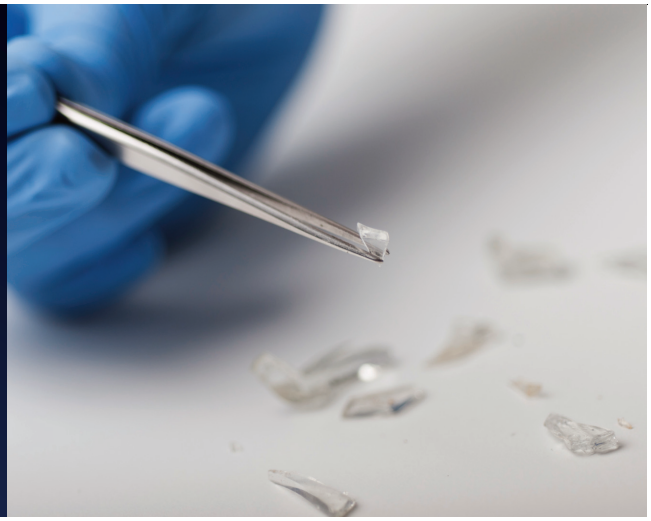
La Lanthanum	Ce Cerium	Pr Praseodymium	Nd Neodymium	Pm Promethium	Sm Samarium	Eu Europium	Gd Gadolnum	Tb Terbium	Dy Dysprosium	Ho Holmium	Re Erbium	Tm Thulium	Yb Ytterbium	Lu Lutetium
Ac Actinium	Th Thorium	Pa Proactinum	U Uranium	Np Neptunium	Pu Plutonium	Am Americium	Cm Curium	Bk Berkelium	Cf Californium	Es Einsteinium	Fm Fermium	Md Mendelevium	No Noelium	Lr Lawrencium

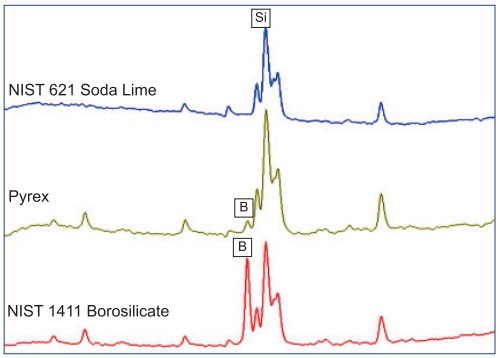
Elements highlighted in Blue can be detected by the ECCO 2

LIBS as a Forensic Tool

Raman spectra exhibit numerous features that are specific to molecular structure providing valuable "signatures" for comparing and differentiating materials, making it an ideal technique for the analysis and identification of forensic trace evidence including:

- Glass fragments
- Pen and printer inks
- Illicit drug precursors
- Paint chips and smears
- Minerals and precious stones



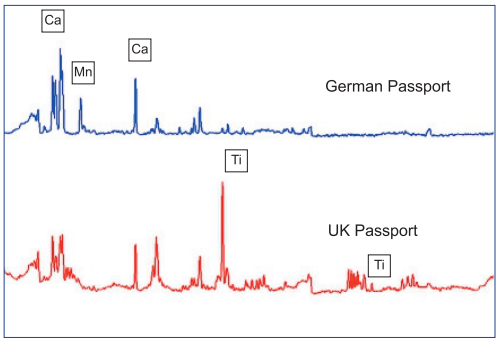


Boron and Silicon peaks differentiate between glass samples

Discriminating Glasses

LIBS can be used to identify many of the elements present in glass down to concentrations of low PPM. In addition the ratios of the spectral peaks of minor and trace elements to those of the major elements are often effective in discriminating between glasses which cannot be separated by refractive index.

Application Note Available



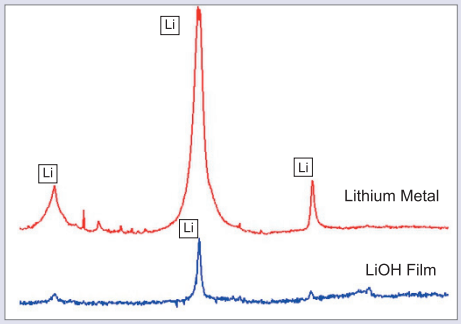
The difference in paper composition of national passports

Document Examination

LIBS is a robust and effective technique for the forensic analysis of questioned documents including identity documents and currency.

ECCO®2 can be used to detect trace elements in paper, pencil lead, writing and printer inks, and within document security features in order to discriminate between the genine and the counterfeit.

Application Note Available

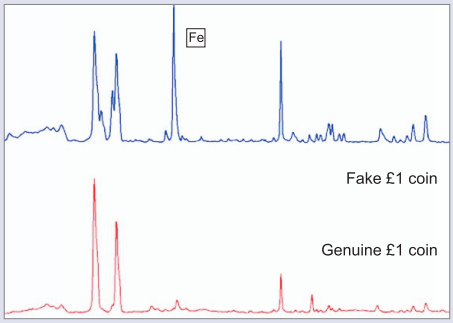


Identification of lithium, a methamphetamine precursor

Illicit Drug Precursors

ECCO®2 can identify lithium, phosphorous and iodine, precursors to the manufacture of methamphetamine. Lithium with atomic number 3 is particularly difficult to detect by other analytical methods.

Application Note Available

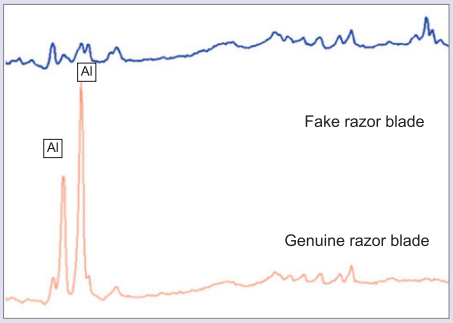


A counterfeit £1 coin is identified by the peaks of iron present in its spectra

Counterfeit Coins

Where close visual inspection cannnot differentiate between real and fake coins, elemental analysis can be used to detect the presence or absence of the specific trace elements that distinguish genuine coins from counterfeit.

Application Note Available



A genuine razor blade has aluminium peaks that are not present in the fake

Counterfeit Goods

The ECCO2 can be used identify counterfeit goods through the examination of its packaging and in some cases of the goods themselves.

software & specifications

ECCO®2 Software and Emissions Library

Uncomplicated and simply presented, the ECCO®2 software provides the user with complete control of all system functions as well as automatic identification of elements.

A live video image of the sample chamber enables accurate sample alignment before spectra acquisition is triggered. Having fired the desired number of laser shots, the resulting spectra is displayed on screen with peaks being automatically identified and labelled.

A comprehensive emissions library is used to identify the elements present within a sample. The library includes pre-selected groups of elements that are relevant to a particular evidence type, e.g. Gun shot residue = Barium (Ba) + Lead (Pb) + Antimony (Sb). Grouping evidence in this way aids the identification and comparison process.

ECCO®2 Laser Induced Breakdown Spectrometer

Order Code: ECCO2

Laser
- Air Cooled actively Q-switched Nd:YAG 1064nm laser
- Full laser safety features

Detector
- Gateable back thinned scientific grade resistive gate CCD covering 225 – 380 nm
- Gateable CMOS detectors covering 380 – 930 nm
- 2 microsecond minimum integration time for UV detector

Spectrometer
- Wavelength range of 225-930nm
- 0.14nm optical resolution in the UV
- Gateable detectors

Sample Chamber
- Large examination bed. Analyse items up to 300 x 210mm
- XYZ sample positioning/focusing stage
- integral colour camera with digital zoom for sample selection.
- Provision for argon atmosphere for increased signal strength

Power Requirements
- 110 - 230VAC

Windows PC and 24" Monitor
- for current spec please contact sales@fosterfreeman.com

The ECCO 2 software suite provides the user with full control of the system hardware and includes the following features:

Spectra Analysis
- Automatic identification of elements
- Comprehensive library of element emission lines
- Comparative display of spectra and peak ratios
- Automatic measurement of peak statistics

Calibration
- NIST traceable wavelength calibration standard 1411
- Automatic or manual calibration

Forensic casework management system
- Export data in text or graphical format
- Research operation mode

SAFETY CLASSIFICATION

ECCO 2 is a Class 1 laser products and is safe under all contitions of use.

CLASS 1 LASER PRODUCT

After Sales Support

Foster + Freeman's excellent product engineering is supported with full after sales support including advice, training and maintenance. For more information on our world-wide services please contact your nearest Sales Office.

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