

Welcome to the 7th issue of the CAMECA electronic newsletter. We are particularly pleased to have released the latest version of our successful IMS 7f ion mass spectrometer - the **IMS 7f-Auto** - a few weeks ago, and to report that our instruments are addressing an ever-broadening range of scientific problems. The 3D Atom Probe for example is now being used for geo- and cosmochemical studies. More details on this application - and others - in this e-newsletter! Wishing you a happy read...

News from our SIMS & NanoSIMS product line

IMS 7f-AUTO: CAMECA'S NEW SIMS TOOL FOR HIGH THROUGHPUT & FULLY AUTOMATED MICROANALYSIS



The **new version of our successful IMS 7f** Secondary Ion Mass Spectrometer - the **IMS 7f-Auto** was unveiled at SIMS Workshop, Philadelphia, last May 17th.

It combines the well-proven features of the IMS 7f (highest dynamic range, best detection limits for light & trace elements...) with additional developments towards **improved automation and operational efficiency** among which:

- Fully redesigned primary column
- Motorized storage chamber & sample exchange
- Advanced automation routines

The **IMS 7f-Auto** can analyze multiple samples in chained or remote mode, possibly overnight. Measurements can be fully unattended and automated, with **unequaled throughput and reproducibility**. More details at [this link!](#)

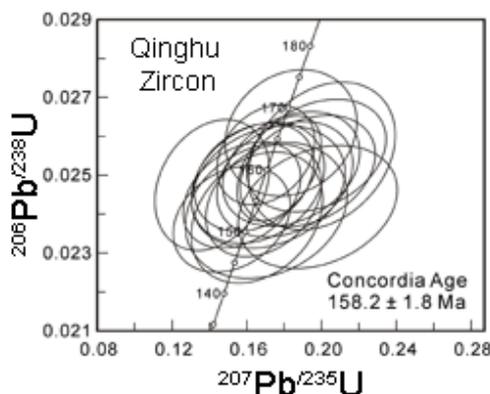
IMS 1280-HR: IN-SITU U-Pb ZIRCON DATING AT A SCALE < 5µm!

The CAMECA IMS 1270/1280/1280-HR instruments have successfully addressed many problems in **U-Pb geochronology**, by providing precise age determination at a lateral resolution of 10-25 µm.

There is an increasing need for improving the lateral resolution for in-situ analyses of fine-grained zircon and/or zircon crystals with complex structural and chemical features.

A new method for U-Pb dating of zircons at a scale down to < 5µm has been developed by the IGGCAS Beijing group, using their IMS 1280. Gaussian illumination mode of the primary ion beam combined with oxygen flooding and optimized transmission settings of the secondary optics result in **precise and accurate (1-2%) U-Pb zircon ages at a scale of < 5 µm**. The method has been demonstrated on well-characterized zircon standards with ages ranging from 1100 down to 160 Ma (shown on the right).

For more details, read the full article on the IGGCAS web site: ["Precise U-Pb zircon dating at a scale of <5 micron by the CAMECA 1280 SIMS using a Gaussian illumination probe"](#), Y. Liu et al., JAAS, 26, 845.



NanoSIMS SUPPORTS CHALLENGING EXPERIMENTS IN CELLULAR BIOLOGY

CAMECA is happy to cite **two outstanding articles** published in the same issue of **NATURE** dated 26 Jan 2012. Pr. Claude Lechene from NRIMS/ Harvard Medical School and co-authors designed and realized experiments involving labeling living tissues with stable isotopes and analyzing them with **NanoSIMS**.

ULTRA SHALLOW B IMPLANT CHARACTERIZATION WITH EXLIE SIMS

The CAMECA **IMS Wf / SC Ultra** now offers **Extreme Low Impact Energy (EXLIE)** SIMS conditions that give access to **ultra high resolution depth profiling**. Thanks to its flexibility in primary beam energy selection, EXLIE SIMS surpasses all existing methods including PCOR for an accurate characterization of implants with very steep profiles such as ultra shallow B implant in Si.

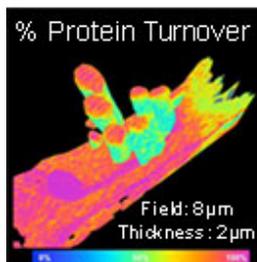
Whereas PCOR cannot measure with a depth resolution better than 1.5 nm/decade, EXLIE SIMS delivers accurate results for B profile from very abrupt interface (down to 0.5 nm/decade) up to a few nm/decade. For more details, [request](#) the new PCOR/EXLIE SIMS application note.

IMS 1280-HR: 4-ISOTOPES SULFUR ANALYSIS WITH ULTIMATE PRECISION

The discovery of mass independent fractionation effects (atmospheric chemistry, metabolic studies,...) has recently led to an increasing interest in 4-isotope sulfur studies, including the 36S very low abundance isotope (~0.02%). The **IMS 1280-HR** provides **4-isotope sulfur data with excellent precision**, using multicollection configuration, good spatial resolution (spot size ~10 µm), and high throughput (15 analyses per hour, fully automated mode). The data presented at this month's Goldschmidt conference show that a spot-to-spot reproducibility < 0.2 per mille (1SD) can be achieved for δ34S, δ33S (and Δ33S). An excellent precision, < 0.3 per mille (1SD), is also obtained for δ36S and Δ36S. [Request your copy](#) of the Goldschmidt poster!

NanoSIMS 50L INCREASING ADOPTION FROM THE SCIENTIFIC COMMUNITY

We are extremely proud to have received three NanoSIMS 50L orders in the first half of 2012 from prestigious institutions including the **EPFL** (Lausanne, Switzerland) for biomineralization and environment, **SINICA** (Taipei, Taiwan) for



The articles are based on two main subjects:

- Testing the immortal strand hypothesis predicting that during asymmetric stem cell division, chromosome containing older template DNA are segregated to the daughter destined to remain a stem cell, thus ensuring lifetime genetic stability, C. Lechene

et al. could prove that this hypothesis is wrong, **using the capability of SIMS to measure in the experiments the number of cell divisions!**

- Studying the protein turnover in tiny hair-cell stereocilia of the inner ear at an unprecedented spatial resolution. Extraordinary 3D movies are freely available as supplement from the Nature website or also [here](#) in a lighter format. The study revealed that fast protein turnover is occurring in hair-cell stereocilia only at the tip end and not by a treadmill process.

In addition, C. Lechene et al. extended their studies to quantifying lipid turnover in *Drosophila* fly and included **the first SIMS studies on white blood cells of healthy human patients**, showing the huge potential of the method in the study of metabolism and cell fate in animals and humans.

cosmochemistry and **UFZ-Leipzig**, Germany for bio-geochemistry and geology.

EUROPEAN NanoSIMS USERS MEETING

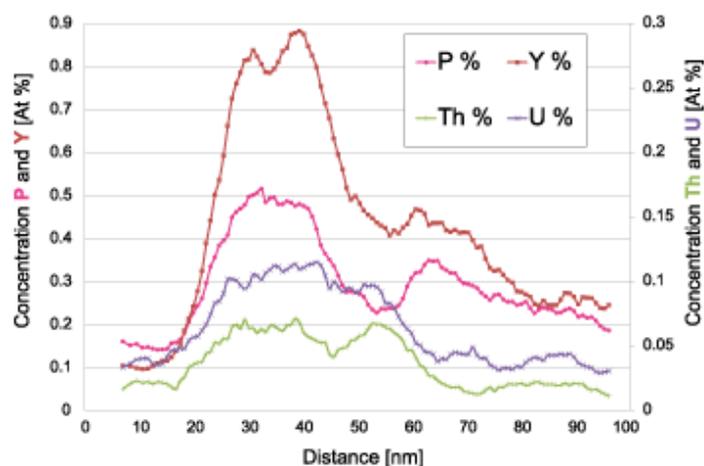
A European NanoSIMS Users Meeting will be organized by our NanoSIMS users at the **Lehrstuhl für Bodenkunde, TU München**, Freising-Weihenstephan, Germany on 15-16th October 2012. Check the [laboratory webpage](#) for more information.

News from our Atom Probe Tomography (APT) product line

ATOM PROBE TOMOGRAPHY OPENS NEW FRONTIERS OF RESEARCH IN GEOCHEMISTRY

Performing 3D quantitative analysis with near-atomic spatial resolution, Atom Probe Tomography has been historically successful in characterizing **metals**, **semiconductors**. More recently, **oxides** have been successfully analyzed. A new field of application is currently emerging as APT has proven capable of delivering **subnanometer chemical analysis of trace elements in minerals**.

Exciting data is to be presented at this month's Goldschmidt conference in Montreal, **the first application of APT in the geosciences**.



The compositional structure of a resorption front in zircon was revealed **at the atomic scale**, showing the distribution of Y, P, Th and U at the boundary between an igneous core and subsequent metamorphic overgrowth, with **ppm sensitivity and subnanometer resolution**.

For more information, you may [request](#) an extract of the Goldschmidt presentation by D.R.Snoeyenbos.

"APT 2012" ANNUAL REVIEW

"**Annuals Review of Materials Research**", vol 42 (2012) features the latest review on Atom Probe Tomography, reporting on the progress made in hardware configurations, data-collection rates, mass-resolving power... The article also gives insight into the burgeoning applications of APT. The number of people using atom probes has quadrupled in the past decade and perhaps most importantly, the number of atom probes being used for industrial R&D has increased by an order of magnitude in that same time!

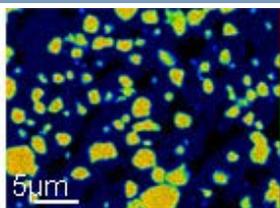
In CAMECA, it has also been **a busy and exciting time around our LEAP 4000 Atom Probe product**. Orders have been received from numerous organizations active in different areas of technology: for mobile displays from a major Korean manufacturer, for metallurgy from Deakin University in Australia, from microelectronics manufacturers in the US and Asia, and from McMaster University in Canada. LEAP orders have also been received from a major Japanese electronics manufacturer and from a leading Japanese government laboratory.

SXFive & SXFiveFE: CAMECA's new EPMA

ACCURATE QUANTITATIVE ANALYSIS OF SMALL PHASES AT HIGH SPATIAL RESOLUTION WITH FE-EPMA

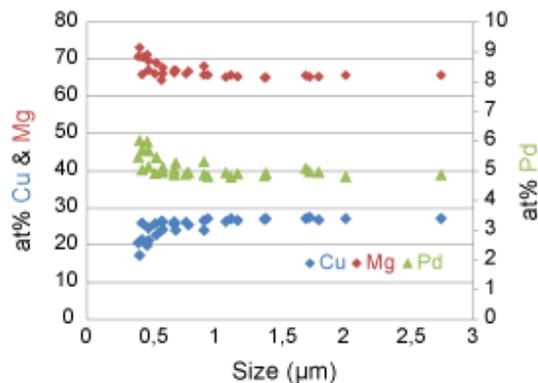
Thanks to its Field Emission source, the CAMECA **SXFiveFE** works with a **focused electron beam at low voltage and high, very stable current**. At 6 keV beam voltage, the penetration depth of the primary electron and thus **the interaction volume decreases to sub-µm scale** (compared to micron scale of the Electron Microprobe at 15 or 20 keV). Lateral resolution is greatly improved! The above X-ray map of Cu acquired at 6 keV beam energy clearly demonstrates a sub-µm spatial resolution.

Accurate quantitative analysis of small phases is also possible in many cases when working at low electron beam energy as illustrated in the curve below showing results for precipitates ranging between 2.5 µm and 0.3 µm.



A REINFORCED EPMA TEAM!

We have great pleasure in announcing that **Dr Chrystel Hombourger** has been appointed **EPMA Application Lab Manager**. After completing her thesis in low energy x-ray spectrometry at Paris VI University, Chrystel joined the CAMECA LEXES group in 1999, and has since then gained valuable experience in assisting customers for a wide range of semiconductor metrology applications. Her expertise in EPMA will be of great support to the SXFive scientific and sales



Sample courtesy of Dr Eric Leroy, CNRS ICMPE Thiais, France.

SEM-EDS vs EPMA

A very interesting article by Dr Ian Holton, Acutance Scientific Ltd. was published in the May 12 issue of *Microscopy & Analysis* under the title *Is Energy-Dispersive Spectroscopy in the SEM a Substitute for Electron Probe Microanalysis?*

This introductory article analyzes the limits of quantification with SEM-EDS and reviews the reasons why, although SEM-EDS is perfectly adequate in some cases, **EPMA remains essential for reliable quantification and trace analysis** in certain classes of work. Where **trace quantities <0.1% concentration** are to be analyzed for example, EPMA must be used. [Request a full copy](#) of this M&A article!

teams.

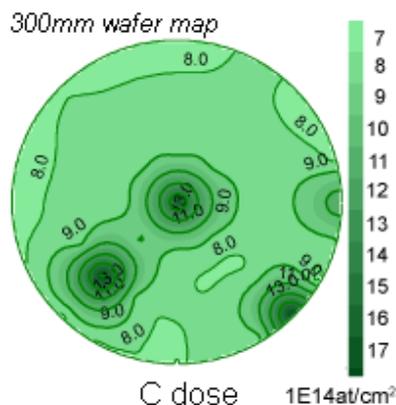
RECENT SXFive ORDERS

The **Indian Institute of Technology, Mumbai** has recently ordered our SXFive microprobe. The instrument will be installed at the Department of Geosciences under leadership from Prof. S. C. Patel, and used for a wide range of applications, from the analysis of monazite for geochronological studies, fossil shells for palaeobiological studies, oxide and sulphide minerals for ore geological studies... to the analysis of metals for corrosion studies.

Installation has also started at **ISTO, Orléans, France**, a leading earth science research institute. Among other applications, the ISTO SXFive will be used for experimental petrology, organic matter geology, biomineralization studies.

Shallow Probe EX-300 Semiconductor Metrology Tool

METROLOGY OF EPITAXIAL STACKS: SiGeB and Si:C P



Strong device performance in CMOS at **22 nm node and below** are ensured by two different types of stressors: SiGe B stacks for p-type MOS, and Si:C P stacks for n-type. Grown by low temperature CVD processes, and engineered with different dopant concentrations, these stacks are very complex and require strict in-line metrology processes in order to ensure optimal final performance.

Traditional techniques such as ellipsometry, XRD and scatterometry are commonly used, but only **LEXES** is capable of measuring the dose and concentration of **both light dopant (C, B, P) and major matrix elements (Ge or C), in blanket as well as patterned** (production) wafers.

In recent years, CAMECA Shallow Probes have supported world-leading fabs in the monitoring of B and Ge at 45 and 32 nm nodes. Thanks to superiority of the LEXES technique, CAMECA continues to strengthen its position in **SiGe B and Si:C P metrology**, successfully accompanying the development of new, complex MOS structures **at the smallest node**.

For more details on the EX-300 Shallow Probe and its diverse applications in strain engineering, memories, HKMG, dopant metrology... [request the EX-300 brochure!](#)

TSMC SUPPLIER SERVICE APPRECIATION AWARD

Yung Tang and Sam Lue, respectively Country and Service Manager for CAMECA Taiwan have received an award from TSMC for outstanding support provided by the CAMECA LEXES team at Fab 12. This recognition from a world-leading semiconductor manufacturer demonstrates the high level of customer service offered by CAMECA.

LEXES-Pilot 1.3: A NEW RELEASE!

Version 1.3 of LEXES-Pilot, CAMECA's control and analysis software for the Shallow Probe metrology tools is currently being deployed at customer sites. It offers major improvements over the previous version, including **automatic monitoring and calibration of the tool**. This new version ensures the smooth integration of our Shallow Probe in the fab, taking an important step towards operator-free production environments.

In company news...

In line with our commitment to providing outstanding support to our worldwide customers, we have recently hired new sales & service staff India, China, Russia, Italy, and installed local CAMECA offices within the AMETEK representations in these countries. New agents have also been appointed over the past months, the last one in Vietnam. All worldwide contacts are at this [link](#).

A successful rowing sponsorship!

AMETEK's Materials Analysis Division and CAMECA have become sponsor of the Sporting Club of Ecole Polytechnique, one of France's most prestigious higher education institutions. More specifically, we support Polytechnique's Rowing Team and have contributed to the purchase of a new boat that entered competition for the first time last Sunday... with great success since Polytechnique's Rowing



Team won the race with a record-breaking time!

As a company, we share the values of this sport where each squad member commits himself to achieve a personal best performance in order to ensure the

success of the entire team. We wish Polytechnique's rowing team under AMETEK-CAMECA colors continued successes in all upcoming competitions!

CAMECA Science and Metrology Solutions - A member of AMETEK Materials Analysis Division

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