CAMECA e-newsletter Nr 10 - May 2014

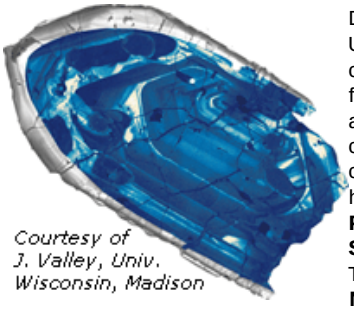
Welcome to the 10th issue of the CAMECA electronic newsletter!

The first months of 2014 have been very exciting at CAMECA, and we are pleased to announce recent instrumental developments including a new ion source for our NanoSIMS, now performing high resolution analysis of electropositive trace elements.

Our instruments are also finding new avenues for a wider spectrum of applications. The Atom Probe for example is now increasingly used by geo and cosmochemists, and even cited in prestigious geoscience publications!

Atom Probe Tomography (APT)

LEAP 4000 USED IN DATING 4.4 BILLION YEAR OLD ZIRCON



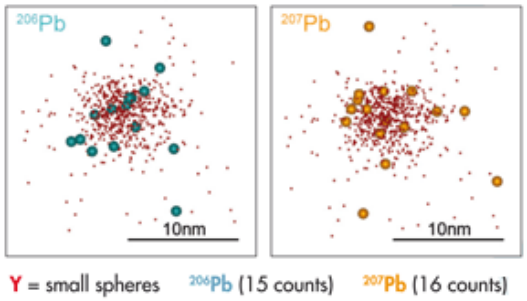
Courtesy of J. Valley, Univ. Wisconsin, Madison

Dr. John Valley, a Professor of Geoscience at the University of Wisconsin-Madison, and his team, collaborating with CAMECA, confirmed that a tiny fragment of zircon crystal from Western Australia is about 4.4 billion years old, making it the oldest confirmed intact piece of the Earth's crust. The crystal, not much larger than the width of four human hairs, was analyzed using the latest **Atom Probe Tomography** and **Secondary Ion Mass Spectrometry** instrumentation.
The article published in February in the journal **Nature Geoscience** confirms that a 400-micrometer zircon crystal from the Jack Hills of Western Australia was formed just 160 million years following the formation of the solar system.

These findings received **wide media coverage** and even singer, songwriter, and actress Beyonce who had worn a dress adorned with hundreds of thousands of blue zircon crystals just days before the Nature Geoscience publication was released forwarded the story onto more than 1 million followers in Instagram...

For in-depth information, read the full Nature Geoscience **article**.

On the right: **LEAP 4000** images of clusters showing the distribution of radiogenic lead isotopes **at a nanometer scale**.



WELCOME TO OUR NEW LEAP APPLICATION LAB IN MADISON!

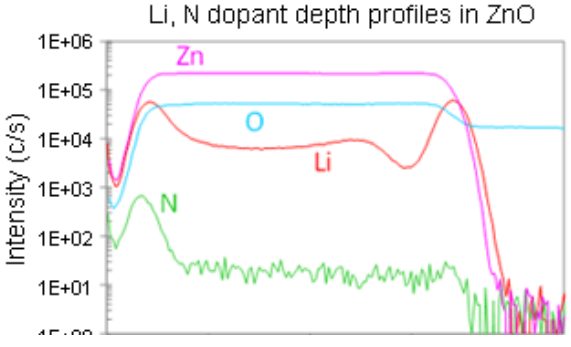
The LEAP Application Team looks forward to welcoming visitors and customers to our new Applications Development Lab in Madison, WI, USA.

The newly appointed lab is both a pleasure to work in and is incredibly functional. The lab's charter is to support our customers and the APT community by improving sample preparation procedures and expanding APT into new applications. To support this work, the lab now has two dedicated state-of-the-art LEAP instruments as well as a new Helios Nanolab 660 FIB/SEM and all of the key sample preparation support systems.

SIMS & NanoSIMS

IMS 7f-AUTO STUDIES DIFFUSION OF DOPANTS IN ZnO

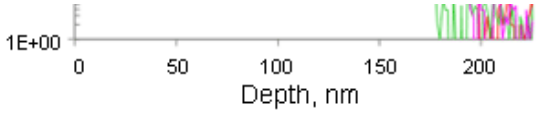
ZnO is a wide-bandgap semiconductor that shows great promise for **high efficiency light emitting devices**. However reliable p-type doping of ZnO remains difficult. The CAMECA **IMS 7f-Auto** application lab recently performed depth profiling on ZnO-based structures provided by the Chinese Academy of Sciences (CIOMP). Li and N doping was investigated for different sample processing. Analyses were performed using MCs+ technique at low impact energy and electron gun for charge compensation.



Li and N in-depth distribution could be successfully characterized, as shown here, demonstrating that the **IMS 7f-Auto** delivers profiles with **excellent detection sensitivity and high depth resolution**, which is essential for **LED technology**.

LEAP / NanoSIMS BUNDLE TO SUPPORT MINERALS & ENERGY RESEARCH IN WESTERN AUSTRALIA

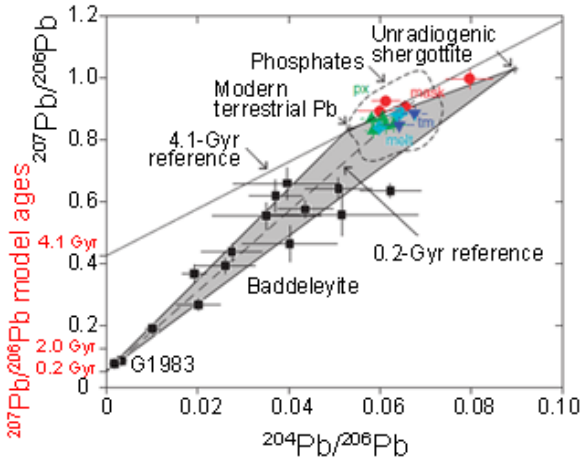
The new Advanced Resource Characterization Facility (ARCF) in Perth, a partnership between **Curtin University**, **The University of Western Australia** and Australia's national science agency **CSIRO*** recently selected **LEAP 4000X HR** and **NanoSIMS 50L** to solve a wide range of mineral exploration-related problems. Thanks to these CAMECA instruments, Perth doubles its capacity to find new mineral ore deposits and positions itself as a global centre for **minerals and energy research**!



MICRO-BADDELEYITE ANALYSIS WITH THE IMS 1280-HR: SOLVING THE MARTIAN METEORITE AGE QUESTION!

The **baddeleyite (ZrO2) geochronometer** is of increasing interest in geosciences, but analyses are challenging because grains are small and cannot be efficiently extracted by conventional mineral separation.

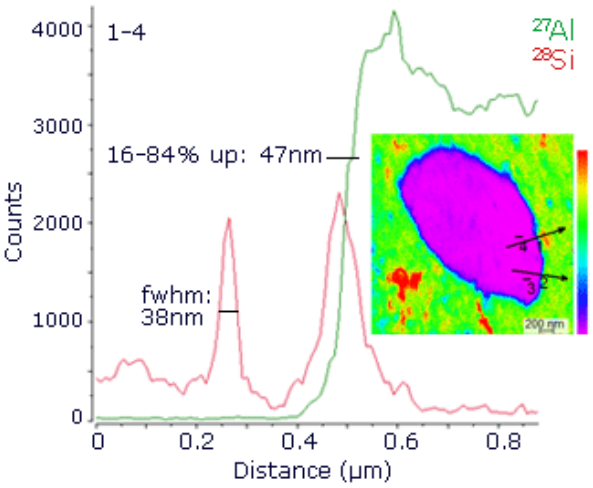
With the **IMS 1280-HR**, analyses can be performed in situ with typical **lateral resolution of 10-20 µm**. Moreover, oxygen flooding minimizes crystal orientation effects and **enhances the Pb+ yield in baddeleyite by a factor of ~7**, thus greatly improving the dating accuracy!



UCLA scientists performed U-Pb isotopic measurements of micro-baddeleyite and host igneous minerals in a Martian meteorite, for which previous interpreted ages were controversial. Results revealed that the baddeleyite grains pre-date the launch event (crystallization 187 Myr before present, and ejection from Mars < 22 million years ago), thus solving the meteorite age question. The full study is published in NATURE!

NEW RF-PLASMA O- ION SOURCE FOR THE NANOSIMS: A MAJOR STEP FOR HIGH RESOLUTION ANALYSIS OF ELECROPOSITIVE ELEMENTS!

In the frame of the MARSS Equipex project of IPREM Pau in France, a new **RF-plasma O- ion source** is under development in order to replace the duoplasmatron on the **NanoSIMS**.



First tests on the IPREM's NanoSIMS 50L have confirmed that **beam size and densities** achieved with the new O- primary ion source **for electropositive trace elements** (alkalis, metals, REEs, uranides), are equivalent to those achieved with the Cs+ ion source for negatives secondaries. Additionally, the new source does not sputter internally, thus **lifetime is now counted in months** between cleaning. Finally **long term current stability is excellent: below 1% over hours**.

More results will be presented at the 23th Annual Workshop on SIMS in National Harbor, MD, USA, next May 27-30. Slides will be sent on request.

STRANN CONFERENCE RUSSIA

Dr. Marc Chaussidon, Paris Institute of Earth Physics (Institut de Physique du Globe de Paris), France, was invited by CAMECA and the organizers of the **4th STRANN Conference, St Petersburg, Russia** to present applications of high precision / high resolution ion probe measurements in earth and planetary sciences. His talk covered exciting **studies recently performed on CAMECA IMS 1280 and IMS 1280-HR models** such as tracing transport of wind-blown aerosol particles, analysis of historial artefacts including emerald of the crown of King St Louis, isotopic imaging of H, D and N in interplanetary dust particles, high resolution depth profiling of the surface of minerals in lunar soils, etc...
Slides of Marc Chaussidon's comprehensive presentations will be sent on request.

FRENCH - BRAZIL BIOSYMPOSIUM

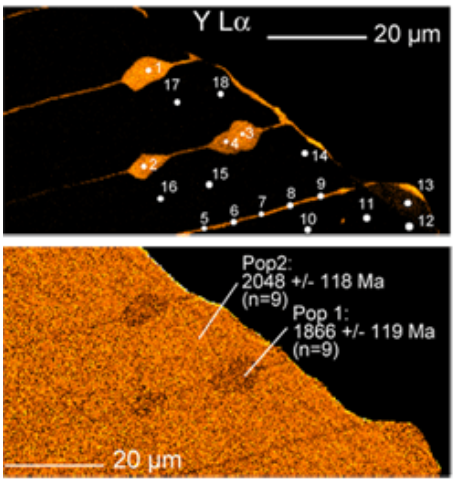
CAMECA was a main sponsor of the **2nd French-Brazilian Symposium on Biosciences**, last March 27-28 in Fiocruz, Rio de Janeiro.
Jean-Luc Guerquin Kern, Institut Curie Recherche, France, was invited to give a talk on **Biomedical applications with the NanoSIMS**. He reported on **pharmacological studies** (cellular distribution of exogenous molecules for diagnostic or therapeutic applications), on **subcellular mapping** of specific chemical elements (especially Fe) associated with certain diseases or poisoning and on **isotopic studies of metabolism**.
Slides will be sent on request.

NEW: Quad SIMS LIFE EXTENSION PROGRAMS

CAMECA has developed numerous upgrades & accessories based on hardware and software evolution. Among these are the new **customized Quad SIMS upgrade packages** specifically designed to improve the reliability and extend the lifetime of Quad **SIMS 4000, 4100 and 4500 models**. Main benefits include: advanced analytical performance using Cs microbeam ion source, latest Windows base SIMS software, more efficient small pad analysis thanks to Mesa+ & Checkerboard, faster troubleshooting & recovery time via remote control...
Please contact our sales team for more information!

EPMA: SXFive & SXFiveFE

THE BEST SUITED TOOL FOR MONAZITE DATING: ACCURATE QUANTIFICATION OF Th, U & Pb AT ULTIMATE SPATIAL RESOLUTION



CAMECA EPMA instruments have been widely used for **chemical dating of monazite**.

Monazite contains significant concentrations of Th and U, and very little initial Pb. Pb accumulates very quickly through the radiogenic decay of 232Th, 238U, 235U and becomes detectable with an Electron Microprobe in 100 Ma old monazites. The **SXFive** & **SXFiveFE** are the best suited tools for measuring U, Th and Pb thanks to their high intensity, high reproducibility WDS and to the excellent stability of their electron columns.

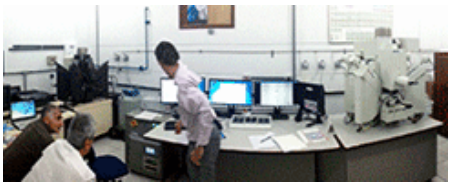
Equipped with a high brightness Field Emission Source, the **SXFiveFE** model allows **accurate quantification of trace elements and monazite dating at ultimate lateral resolution**.

	Population 1 (Point 1 to 9)			Population 2 (Point 10 to 18)		
Element	**Th**	**U**	**Pb**	**Th**	**U**	**Pb**
Mean (ppm)	53474	2035	5294	61323	1834	7803
2 σ (ppm)	27	95	185	29	87	201
Domain Age (Ma)	**1866**			**2408**		
2 σ (Ma)	119			118		

Sample courtesy of Dr. M.J. Jercinovic, UMass, USA and Dr. R.G. Berman, Geological Survey of Canada.

CAMECA INVITES TO EPMA WORKSHOPS AROUND THE WORLD

SXFive Product Manager Michel Outrequin travels the world to deliver **hands-on sessions on SXFive & SXFiveFE** microprobes!
His 2014 tour started in Porto Alegre, Brazil, with the First South-American Workshop on Electron Probe MicroAnalysis hosted by the Institute of Geosciences at Universidade Federal do Rio Grande do Sul, March 27-29.

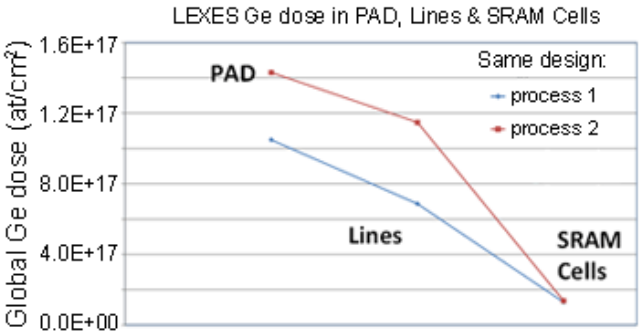


Next EPMA workshops and user meetings will take place:
- at the National Institute of Oceanography Goa, India, May 20-22
- at WITS University, Johannesburg, South Africa, August 27-28.

EX-300 Shallow Probe: Supporting innovation at 14 nm and beyond

FROM PLAIN PADS TO DEVICES

With its 30 µm diameter beam and a robust pattern recognition system, the **EX-300 Shallow Probe** is able to address small pads of different geometries, measuring the composition on various features: lines, fin's or transistors. As on large pads or blanket wafers, it performs efficient wafer mapping and indicates areas that do not fulfill the compositional specs.



On the left side example, we measure the Ge dose for three different features (PAD, line and SRAM cell) on the same wafer for 2 different processes.

The Shallow Probe detects that both processes do not behave the same way depending on the area, and a growth loading effect is observed from pad to lines.

We are continuously adapting our LEXES technology to the new structure geometries and will present **recent Shallow Probe results on As doped fin's** at the next IIT conference, June 26-July 4 in Portland, OR, USA.

IMPROVED PERFORMANCE FOR BORON DETECTION

Boron is a key component of epitaxial layers in strain engineering, as well as the dopant of choice for the p-region in Si or SiGe MOFSETs. As for all light elements, efficient process monitoring of Boron is challenging.

The **Shallow Probe** has successfully addressed boron metrology since the 90 nm node.
Our **latest boron detection crystal (LPCB)** delivers **up to 30% precision improvements for low boron levels** in SiGe matrices.

All Shallow Probe systems can be equipped with the new LPCB. Please contact your local sales rep for more details on how to upgrade your system!

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