Raman Update

HORIBA JOBIN YVON

Autumn 2006

Welcome to the Raman Update, produced by HORIBA Jobin Yvon's Raman Team, to provide our customers, colleagues & friends with up-to-date information in the field of Raman instrumentation and applications.

See us next at:

MRS Fall

28th - 30th Nov ‘06
Boston, MA,
USA

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LabRAM ARAMIS IR²

High Performance Raman and FTIR Just Got Easier

Combining two vibrational spectroscopic techniques (Raman and FTIR) in an automated easy to use instrument that saves time, money and lab-space

HORIBA Jobin Yvon is pleased to announce the introduction of the LabRAM ARAMIS IR². This instrument is the successor to the popular LabRAM IR, the winner of the Gold Award for the best new product at Pittcon in 2002.

New features of the LabRAM ARAMIS IR² series include FTIR mapping capabilities, a breakthrough made possible through the use of the company's LabSpec 5 chemical mapping software. This capability is unique to HORIBA Jobin Yvon and represents a significant step forward for combined confocal Raman and FTIR analysis. So where previously only single spot FTIR measurements have been available, for the first time a complete 2D chemical image derived from both Raman and FTIR spectral information can be obtained. The SameSPOT™ technology ensures that optical, Raman and FTIR images are generated from the exact same sample position.

The new FTIR unit has improved imaging functions, smaller IR objectives for easier operation and automated aperturing for spatial filtering control. It can also be added as an upgrade to many existing LabRAM Raman microscopes.

The LabRAM ARAMIS IR² can accommodate a range of temperature and humidity cells so that polarised light microscopy (PLM), Raman and FTIR can be used to study important applications such as pharmaceutical polymorphism and salt screening.

Further applications for the systems include:
- Forensic science,
- Museum conservation,
- Polymer science,
- Contamination analysis,
- Materials characterisation.

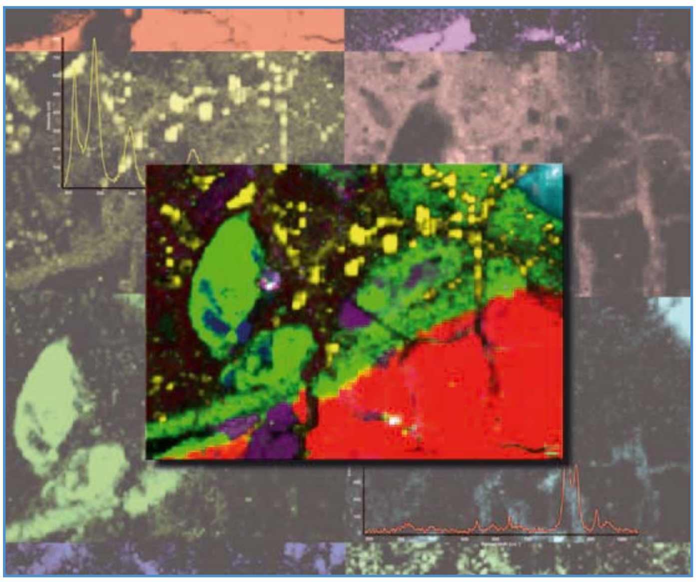
Find out more on our website wwww.jobinyvon.com/Raman

Raman Imaging Competition 2006

HORIBA Jobin Yvon continues to acknowledge the often ground breaking research of its customers, and launched its second Raman Imaging Competition in July 2006. The prize was a copy of the advanced image processing software ISys® from Spectral Dimensions (now part of Malvern Instruments), and their Raman image on the front of the international magazine Microscopy and Analysis (Wiley Publications).

The winning entry for 2006

HORIBA Jobin Yvon would like to thank everyone for the high number of quality contributions to the competition, which made the task of selecting a winning image difficult. The most appropriate image is shown below and followed by the accompanying application article.



Winning Raman image of the Tenham meteorite. Sample courtesy of Dr J. Spray, Planetary and Space Science Centre, University of New Brunswick, Fredericton, Canada

The Raman Image Gallery can be viewed on the HORIBA Jobin Yvon website, where you can discover Raman images from HORIBA Jobin Yvon users. We also invite you to send us your Raman images to be placed on the Raman Imaging Gallery to share your experiences with other Raman users. Should this be of interest to you please send your image with a short summary to raman@jobinyvon.fr with the subject title "Raman Image Gallery".

Don't forget to see the cover page on the November 2006 edition of Microscopy and Analysis (Americas and Asia/Pacific editions).

Solid state mineral structural transformations

Measurements by Dr Eunah Lee, HORIBA Jobin Yvon Inc.
Data courtesy of Dr. J. Spray, Planetary and Space Science Centre, University of New Brunswick, Fredericton, Canada

Due to intra-asteroid belt hypervelocity collisions, asteroids can experience very high pressures and temperatures followed by lofting from the asteroid surface and release into space as fist-size fragments. Once thrown into space, asteroid fragments may eventually be caught in the gravity fields of larger planets and fall to the surface as meteorites.

The impact-related 'shock' processes can also cause solid state mineral transformations, which involve changes in structural state. For example, olivine can be changed to ringwoodite, and pyroxene to majorite. These are known as polymorphic transformations. Intricacies of the shock wave-rock interaction result in a heterogeneous distribution of high-pressure polymorphs, the cause of which is not understood.

Mapping mode Raman microscopy can determine the spatial distribution of polymorphs in order to assess the shock excursion mechanisms. This was achieved in this work by setting up a 130 x 93, 1 µm spacing, point map of a selected shock vein region in the Tenham meteorite sample (Fig. 1). These investigations were carried out on the LabRAM ARAMIS at 633nm.

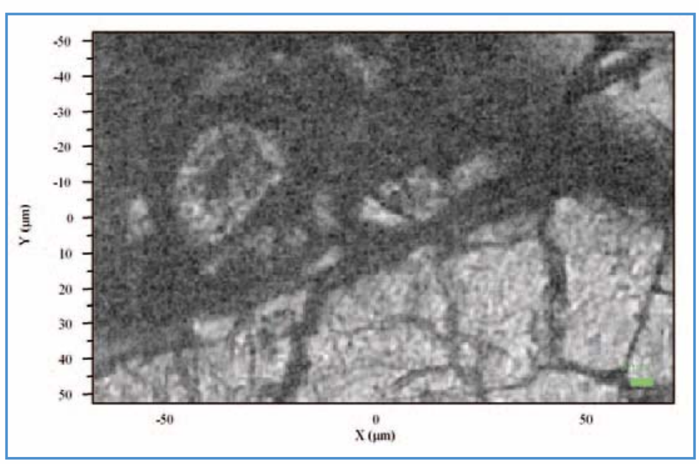


Figure 1. Photomicrograph of the Tenham meteorite (polarized light) as mapped.

The Raman spectra of different phases with the same composition are distinguishable due to their distinct crystalline structures. The Raman image that highlights each of the mineral phases provides the spatial correlation between the same elemental composition but different crystal structure arising from the shock localization process.

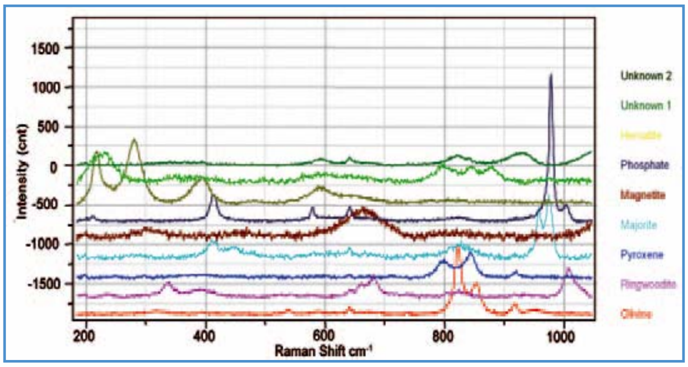


Figure 2. Reference spectra and assignment

Manual exploration of the spectral hypercube data set reveals at least nine unique spectra, seven of which could be tentatively assigned to known mineral phases.

These spectra were used as references in 'Modeling', a chemometrics tool available in LabSpec 5, to calculate 'factor scores' of the individual spectra. The 'score' of a spectrum with respect to a reference spectrum can be considered an indicator of the degree of similarity between two spectra. Areas with high scores for a reference spectrum are areas of high abundance of the mineral. The combined scores images (color-coded) show the spatial correlation between different minerals and their structural states.

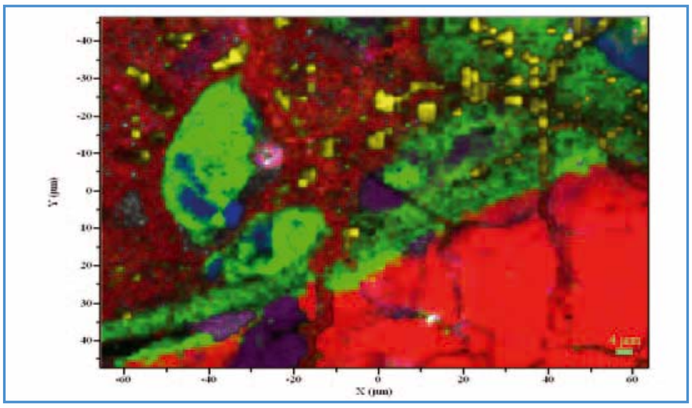


Figure 3. Combined scores image (colors as for Figure 2 above).

See further application examples and system specifications on the HORIBA Jobin Yvon website:

www.jobinyvon.com/Raman

Raman investigation of microorganisms on a single cell level

By Michaela Harz[1], Petra Rösch[1] and Jürgen Popp[2]

[1] Institute of Physical Chemistry, Friedrich-Schiller-Univ Jena, Germany

[2] Institute for Physical High Technology Jena, Germany

In many fields like food quality control or pharmaceutical and cosmetics production, an early microbial identification is crucial to guarantee no contaminations. Previous research has shown the potential of Raman spectroscopy in combination with chemometric methods to investigate bulk samples as well as single bacteria and yeast cells for classification on the species and strain level.

Analysis of microorganisms

For Raman analysis, the grown cells were taken from the agar plates and smeared by a diluting loop on a fused silica plate (Figures 1A and1B). Micro-Raman spectra from single bacterial cells and yeast cells from different species are shown in Figures 1C and 1D respectively.

Raman spectroscopy and a supervised classification method have been used for the identification of bacteria and yeasts on a single cell level. It could be shown that it is possible to reach a promising recognition rate not only for bacteria, but also for yeast cells (average recognition rate: 86.2 % on strain level, 96.3 % on species level).

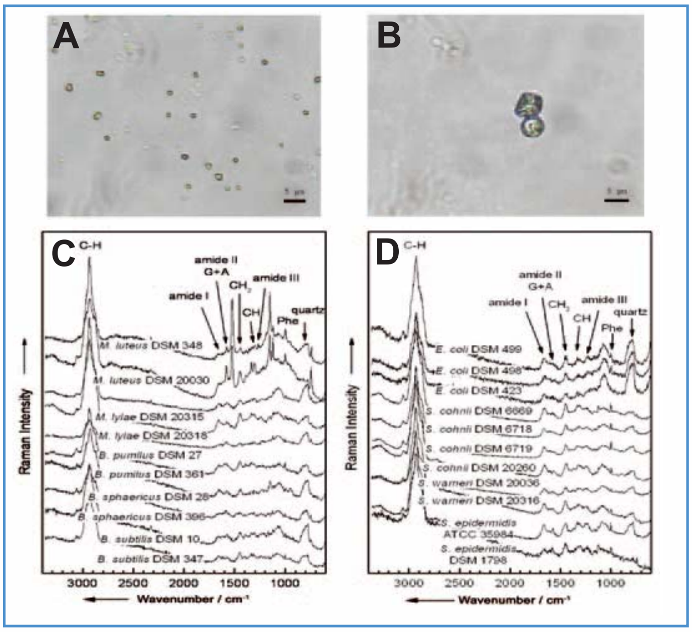


Figure 1: Microscopic image of a smear of single bacterial cells (A) and yeast cells (B). Micro-Raman spectra of different bacterial strains of the genus Bacillus and Micrococcus (C) and different yeast strains (D).

See our application notes for the full article.

Raman Resources and FAQ's now available on the Raman website

www.jobinyvon.com

The Raman Team of HORIBA Jobin Yvon continues to develop the Raman Resources section on their website. Visit the site to see what's new.

The Raman Resources consists of:

- **Raman Image Gallery:** a selection of short research abstracts illustrate some of the varied and numerous applications where HJY Raman equipment has been used.
- **Raman Tutorial:** a brief introduction to modern Raman spectroscopy which aims to introduce the principles and techniques of Raman spectroscopy to an expanding audience.
- **Raman Articles:** articles of interest.
- **Raman FAQs:** explanations to 'Frequently Asked Questions'.
- **Raman Bands List:** reference data table for Raman.
- **Raman Application Notes:** a wide range of application notes showing the numerous applications of Raman Spectroscopy.

SEE US NEXT AT:

12th - 15th November 2006
EAS
Somerset, NJ, USA

14th - 16th November 2006
AVS,
San Francisco, CA, USA

22nd - 23rd November 2006
CMOI,
Mulhouse, France

27th November - 1st December 2006
MRS Fall
Boston, MA, USA

28th - 30th November 2006
NanoSolutions,
Köln, Germany

To find out about other conferences and exhibitions at which HORIBA Jobin Yvon shall be present consult our website: www.jobinyvon.com/Raman

MALVERN INSTRUMENTS & HORIBA JOBIN YVON

Spectral Dimensions, acquired by Malvern Instruments in July 2006, and HORIBA Jobin Yvon proudly announce the availability of Spectral Dimensions' ISys® Software for use with HORIBA Jobin Yvon imaging systems. ISys® has rapidly become the industry standard software product for processing chemical images. ISys® product capabilities have been designed to meet the processing requirements of both laboratory and process analytical technology environments.

Find out more about ISys® Software, visit our website or contact us.

Contact Details

For further information on any of the articles within this newsletter, or should any of your colleagues wish to be part of our mailing list, or should you have queries or comments, please contact Joanna.Mason@jobinyvon.fr or any of the following addresses :

Don't forget to check out our website:

www.jobinyvon.com

where you can find details on all our systems, accessories.

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