## 6 March 2015

## Using Raman spectroscopy to study materials under extreme conditions

**The CEMHTI laboratory of CNRS, Orléans, France, uses Raman spectroscopy to study materials under extreme conditions, such as at elevated temperatures and when irradiated with particle beams.**

Dr Patrick Simon works with materials under extreme conditions of high temperature and irradiation. His lab, known as Conditions Extrêmes et Matériaux: Haute Température et Irradiation (CEMHTI), is located at the National Centre for Scientific Research (CNRS) in Orléans, around 110 km southwest of Paris. His team, and more generally the CEMHTI laboratory, uses spectroscopic methods to study materials submitted to extreme conditions, such as high temperatures (more than 2000°C) and irradiation with particle beams (usually He2+ ions or α particles). They perform studies of these materials either after their exposure to these hostile conditions, or during them; for example, *in situ* measurements in a furnace or inside a particle beam accelerator.

Their pioneering work involves the investigation of a varied range of materials: from glasses and ceramics (for high temperature applications) to materials for nuclear applications or those submitted to irradiation, especially uranium compounds; also silicon carbide and nuclear graphites. They also study monocrystalline or thin films systems, carbonaceous materials and earth sciences materials. An important part of the group activity is in method development. This includes *in situ* measurements, high spectral stability spectroscopy and Raman image data processing.

Dr Simon’s group has access to several types of Raman spectrometer but it is the Renishaw inVia confocal Raman microscope that they use as their reference instrument, using it to test all new materials. It is used also for temperature studies below 1200 °C and for practically all measurements which are not *in situ* under irradiation. Although Dr Simon studies materials submitted to extreme conditions, the inVia’s stability ensures reliable results are obtained. The group also uses a portable Renishaw RA100 Raman Analyser with optical fibre connections when remote measurements are needed.

Dr Simon believes that there are multiple benefits of using the inVia system. He explains: “We like the ergonomic design and the ease of operation; inVia’s high efficiency; the ability and speed to change a laser line without moving the sample under study. We like the internal calibration of frequency, the possibility of automatic adjustments, the different imaging modes - from the traditional point-to-point to the rapid StreamLine mode. I have also to stress the high efficiency of the Renishaw team, to solve any problem or question we have on the machine.”

For further details of Renishaw’s inVia confocal Raman microscope and other spectroscopy solutions, visit [www.renishaw.com/raman](http://www.renishaw.com/raman).

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### About Renishaw

Renishaw is a world leading engineering technologies company, supplying products used for applications as diverse as jet engine and wind turbine manufacture, through to dentistry and brain surgery. It employs over 3,700 people globally, some 2,400 of which are located at its 15 sites in the UK, plus over 1,300 staff located in the 32 countries where it has wholly owned subsidiary operations.

For the financial year ended June 2014 Renishaw recorded sales of £355.5 million of which 93% was due to exports, the largest markets being the USA, China, Germany and Japan.

The Company's success has been recognised with numerous international awards, including seventeen Queen's Awards recognising achievements in technology, export and innovation. Renishaw received a Queen’s Award for Enterprise 2014, in the Innovations category, for the continuous development of the inVia confocal Raman microscope. For more information, visit [www.renishaw.com](http://www.renishaw.com).

### For further information

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