CT Scanner CAF Central Analytical Facilities STELLENBOSCH UNIVERSITY

CT NEWS

The Stellenbosch CT scanner facility newsletter

"more than just a scan"

November 2014

In This Issue

Recent interesting scans (clickable links)

Sample size vs resolution explanation both microCT and nanoCT
http://blogs.sun.ac.za/ctscanner/2014/11/20/sample-size-vs-resolution-example/

Highlight: We've got RAMAN!
http://blogs.sun.ac.za/ctscanner/2014/11/19/weve-got-raman/

Automotive casting – water pump
http://blogs.sun.ac.za/ctscanner/2014/11/04/automotive-casting-water-pump/

Oil pump
http://blogs.sun.ac.za/ctscanner/2014/11/04/oil-pump/

Welcome

Welcome to the November newsletter – in this edition we focus on **application** of the different analytical techniques available at our facility (X-ray CT, RAMAN Spectroscopy) and how you can prepare your samples to get the optimal results from the samples. Contact us for quotations, more information or when planning your materials analysis!

Special offer

We invite students to come in for special rates on data analysis during December. R1000 for the month, or R100 a day. All students welcome, interns will be available for assistance.

Sample size vs resolution explanation both microCT and nanoCT

The most common misunderstanding people have the first time they use either microCT or nanoCT is how the sample size relates to the achievable resolution. In the following example we will try and provide you some insight into how these two parameters work together. To illustrate the example we scanned a packet of cigarettes at a range of different resolutions in order to show how sample size influences this.

The main parameters that must be kept in mind are 1) the detector used to capture the image and 2) the position of the sample relative to the X-ray source/tube.

In order to capture the entire sample the sample image must fit in the field of view of the detector (Figure 1). The full pack of cigarettes was scanned at 100 micron

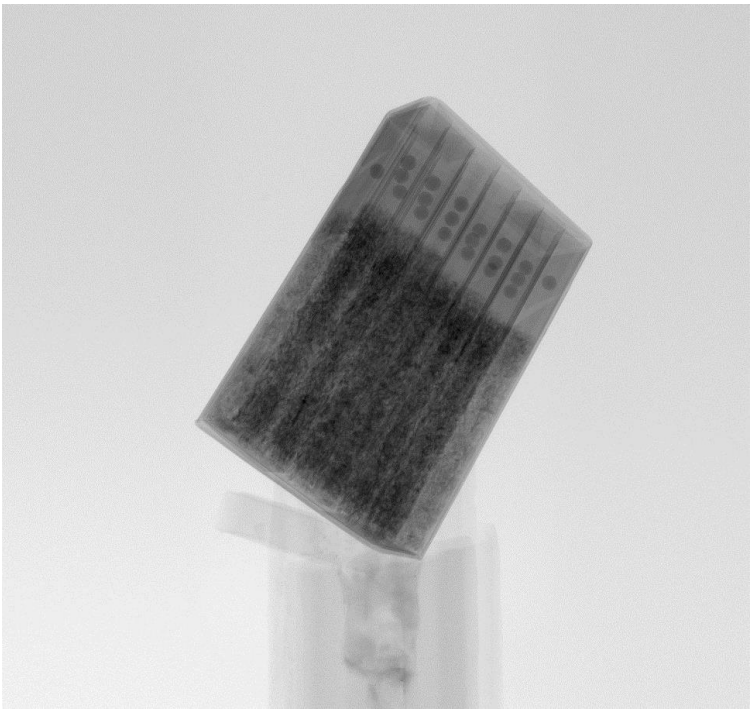

Figure 1: X-ray image of a pack of cigarettes at 100 µm

resolution. In order to increase the resolution of the scan the samples is moved closer to the source/tube which decreases the field of view of the sample. To be able to do a 500 nanometer scan of a sample the sample must be small and almost on the X-ray source/tube (Figure 2). The distance between the X-ray source/tube a sample is then approx between 4 and 1mm.

For cigarette X-ray and CT images of resolutions 100, 50, 5 and 1 microns, see this page:

http://blogs.sun.ac.za/ctscanner/2014/11/20/sample-size-vs-resolution-example/

Highlight: We've got RAMAN!

Raman spectroscopy is a powerful technique which allows materials to be discriminated from each other based on their Raman spectral fingerprints. It is used for qualitative testing of material types, eg. testing if milk powder contains melamine, or can be used for quantitative investigations by setting up calibration models.

We have available a newly installed student-friendly Raman microscope, with monthly access fees. We can also do specific tests and projects on demand, at hourly rates. Please contact us for more information.

A spectral analysis was performed (Figure 3) which show how 3 types of polymers can be discriminated from one another. Polymers 1 and 9 are two types of Acetal (having similar chemical structure as shown by similar spectral fingerprints, yet not identical). The Polymer #4 is Polyethylene, with a totally different chemical fingerprint. Different polymers can be identified based on their Raman spectra, while specific peak values can be correlated to specific molecular bonds present in the samples. For more information on Raman spectroscopy see the Wikipedia page: http://en.wikipedia.org/wiki/Raman_spectroscopy

More information:

http://blogs.sun.ac.za/ctscanner/2014/11/19/weve-got-raman/

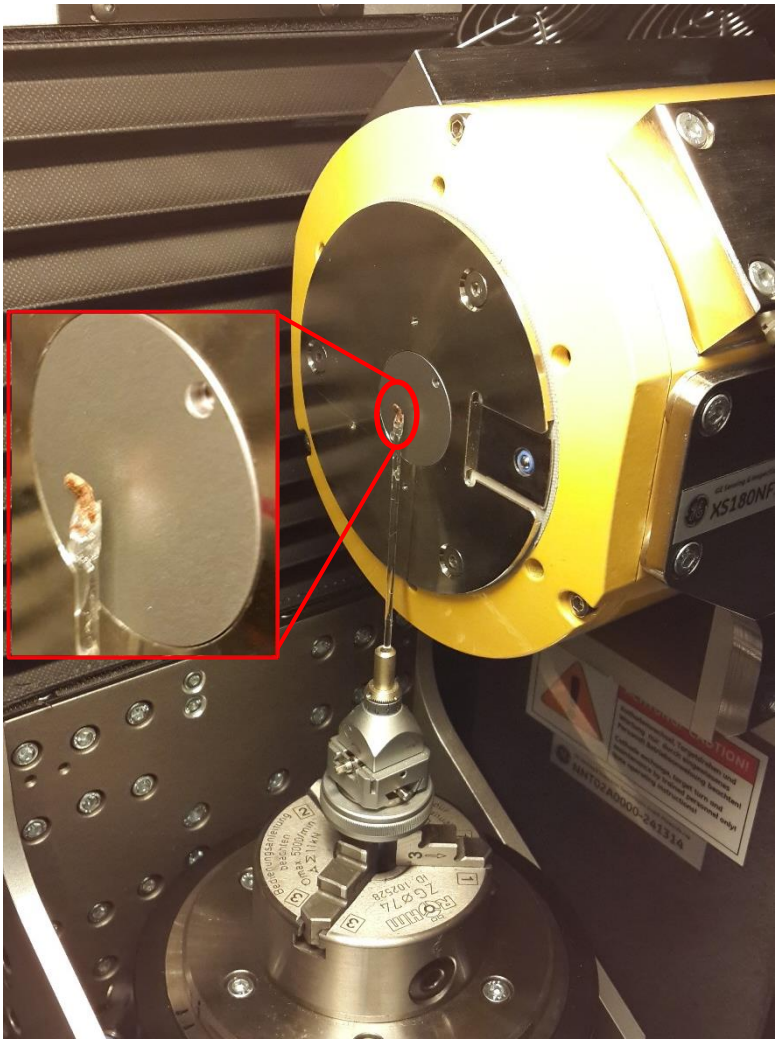

Figure 2: Scan performed at 500 nanometer on a piece of Tabaco from the cigarettes.

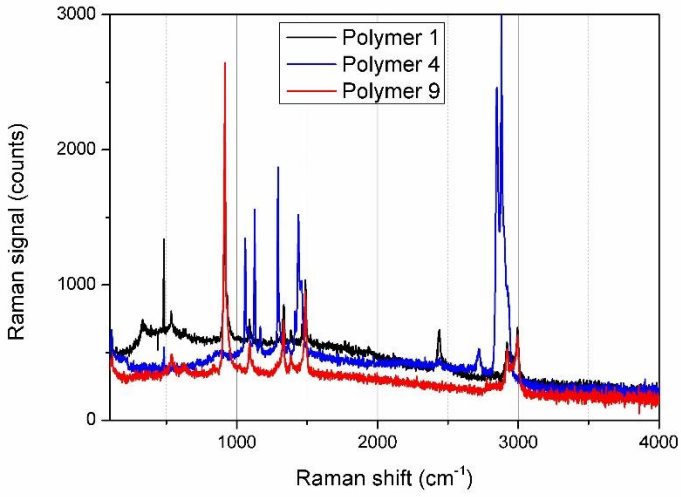

Figure 3: In some previous work we have used polymers for density calibrations in X-ray CT scans. By combining X-ray CT with spectroscopy, the possibilities for a more complete materials analysis are improved greatly.

Contact Us

http://www.sun.ac.za/ctscanner

Staff scientist – Anton du Plessis, PhD

anton2@sun.ac.za

Analyst – Stephan le Roux, MSc

lerouxsg@sun.ac.za

021 808 9389

Physical address for sample deliveries:

CT Scanner Facility, Room 1046

PO Sauer building - Dept Forestry and Wood Science

Bosman Street, Stellenbosch

7602

Acknowledgements

The CT scanner equipment acquisitions were made possible with grants from the National Research Foundation and Stellenbosch University. The Department of Science and Technology Internship program is also acknowledged for its support of this facility. We encourage and welcome any form of sponsorship or support in order to keep delivering the best quality.

To subscribe or unsubscribe from this mailing list, please send an email with the subject line "subscribe" or "unsubscribe" to anton2@sun.ac.za

Introducing CRxVision™ from GE: A High-Resolution CR Scanner for Weld and General Purpose Inspections

Packed with innovative features to increase throughput, extend plate life and provide excellent image quality, the CRxVision is designed specifically for the inspection of welds. The scanner is developed to cover the stringent ISO 17636-2 Class A and B requirements, as well as ASTM, ASME and EN weld standards. Because of its versatility, it can also be used for many other applications across the NDT industry.

LinkedIn Follow GE Inspection Technologies on LinkedIn™ for product news and applications reports: https://www.linkedin.com/company/ge-inspection-technologies

www.ge-mcs.com/x-ray