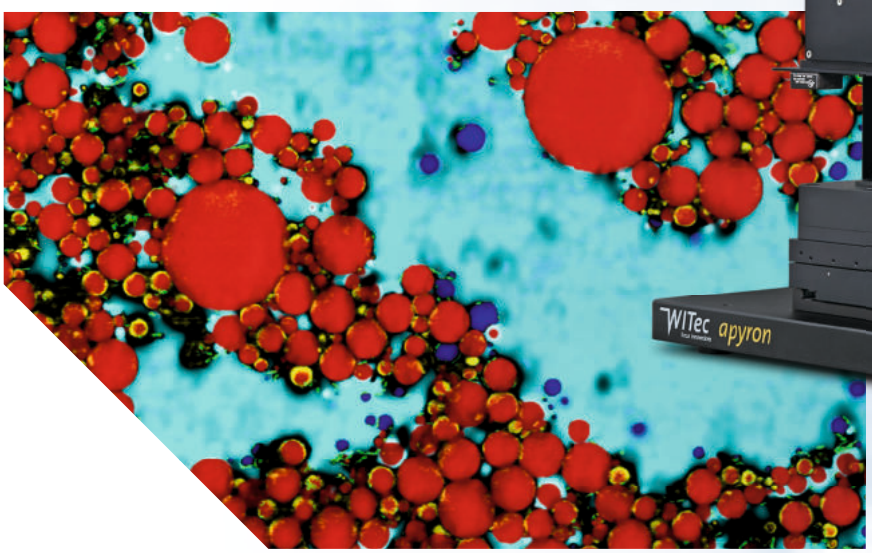
Virtual Raman Imaging Poster Summit 2020



International Conference for
Chemical Characterization & Imaging

September 28th – October 2nd, 2020

A Virtual Introduction

Each autumn for the last 16 years, WITec has hosted the Confocal Raman Imaging Symposium. This year, we decided to postpone it due to the ongoing pandemic. It was a very difficult decision for us as the conference is one of the most important events in our calendar, and one that we especially look forward to. It's therefore a great consolation that every speaker we'd invited has confirmed their participation in next year's event, the 17th Confocal Raman Imaging Symposium, which will be held in September 2021.

The primary aim of our Symposium is to bring the Raman community together and provide a platform for presenting and discussing the latest developments and applications in Raman imaging microscopy. Scientific exchange is even more important in the current situation, when international travel involves new precautions and complications, but research around the world continues to make rapid progress. With this year's conference postponed, we wanted to offer an alternative forum for the Raman community to engage and interact. Our efforts resulted in the first Virtual Raman Imaging Poster Summit, a one-week online poster session that offered researchers the possibility to share and discuss results from the convenience of their home offices.

We were amazed at how well the format was received. There were about 250 participants and a total of 55 posters covering various fields of application. The enthusiastic response confirmed that scientists are eager to share their recent results and find new modes of engagement with their colleagues. It was also apparent that the online format of the conference gave it a very international character, because it facilitated participation from every global region.

This spring, many researchers had only limited access to their labs, which of course made it challenging to continue performing measurements as usual. We saw that many scientists focused on data analysis in these months and profited from the extensive functionality of our software suite and in particular from our special Home Office License. However, experimental research in laboratories also continues even when the amount of time spent in home office has increased. In line with these developments, WITec launched the new generation alpha300 *apyron* in April. This fully automated confocal Raman microscope can carry out self-alignment and self-calibration to optimize reproducibility and performance. Another advantage is that it can be controlled completely remotely, with only the placement of the sample requiring physical interaction. Thus, even measurements from home offices become possible.

We thank everyone who contributed to the success of the first Virtual Raman Imaging Poster Summit and we hope to welcome many of you next year in Ulm at the 17th Confocal Raman Imaging Symposium.

Stay safe and healthy.

Olaf Hollricher and Joachim Koenen
Managing Directors at WITec GmbH

Correlative Imaging Applications
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Q-switched Nd:YAG laser on dental enamel with photoabsorber: a confocal Raman pilot study

P. Castro[1], D. Pereira[1], P. Ana[2], C. Matos[3], D. Zezell[1]
[1]Nuclear and Energy Research Institute, Center for Lasers and Applications, Sao Paulo, Brazil, [2]Engineering Modelling and Applied Social Sciences Center, Santo Andre, Brazil, [3]MackGraphe - Graphene and Nanomaterials Research Center, Sao Paulo, Brazil

Nd:YAG lasers emitting λ = 1064 nm at microsecond and nanosecond pulses are alternatives to prevent dental caries and erosion in clinics. This wavelength allows most of photons to penetrate deep in the hard tissue due to low absorption of hydroxyapatite in the region. It is necessary to use photoabsorbers so most of photons are absorbed in the surface of the tissue preventing dental pulp necrosis. Currently the coal paste is used as a photoabsorber but the irradiated tissue turns darker what implies in the patients low adherence to the treatment due to aesthetic reasons. [1,2]. Confocal Raman spectroscopy is a non-destructive optical method to obtain detailed information about molecular composition of biological structures in depth. The most prominent feature of Confocal Raman spectroscopy is the reliable capability to provide the biomolecular data with no use of ionizing radiation to penetrate in the sample. This work aims to characterize the dental enamel irradiated with Nd:YAG laser with nanoseconds pulses, in order to describe the depth related changes promoted in the enamel, by the heat generated due to laser irradiation. For these measurements, 30 bovine enamel blocks of 8 mm^2, were randomized into 3 groups: G1 – enamel untreated; G2 – enamel irradiated with Nd:YAG nanopulsed laser (1064 nm, 4 W; 1,05 J/cm^2; 5 ns 20 Hz, Brilliant, Quantel Laser) using a coal paste as photoabsorber; G3 -enamel irradiated with Nd:YAG nanopulsed laser (same parameters as G2) using squid ink as photoabsorber. The assessments of three different depth regions of the cubic shaped samples were: region A- left corner above of the sample, region B-middle of the sample and Region C- right corner below of the sample. The intensity map of phosphate (950 cm^{-1}) regarding the position, were calculated [3,4] as shown in the Figure 01.

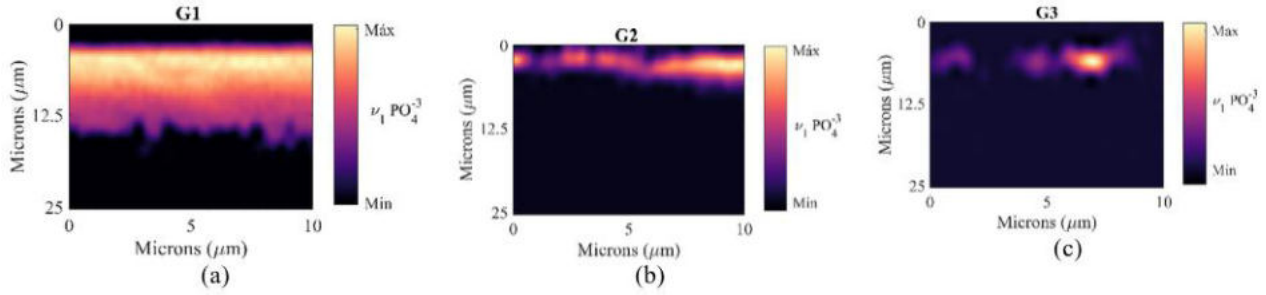

Figure 01: Phosphate intensity maps of (a) Enamel untreated - (b) Enamel with coal paste irradiated with Nd:YAG nanopulsed laser (c) Enamel with squid ink irradiated with Nd:YAG nanopulsed laser.

The comparative results in the Fig.1 demonstrated that application of coal paste associated with Nd:YAG (G2) can preserve the inorganic content better than the squid ink group (G3). These findings have crucial clinical implications in the laser protocol development and it was possible to correlate the heat penetration depth of the laser irradiation with photoabsorber using the images obtained by the confocal Raman.

REFERENCES

[1] D. L. Pereira et al, Int J Mol Sciences 19, 433-447, 2018.
[2] P. A. Ana et al, Caries Res, 46, 441-451, 2012.
[3] J. B. Holly et al, Nat. Protrocols. 11, 664–687, 2016.
[4] H. C. Charles et al, Nat. Photonics 8, 627-634, 2014.