ADVANCES IN RAMAN MICROSCOPY: PUSHING THE LIMITS OF CHEMICAL IMAGING

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The Microanalysis of nano to micro scale structures in biological models, organic or inorganic materials brings a very rich information for Physical-chemical understanding that can be added to conventional optical observation at the microscopic scale. A large panel of techniques can be applied to Microanalysis such as Raman spectroscopy, steady or time resolved Fluorescence and X-ray Fluorescence. They all together offer very complementary information on molecular and elemental composition and Structure. A few examples will be provided to also discuss their complementarity from the spatial resolution point of view.

Focusing further on the Raman microscope, this analytical tool has become powerful for many applications including pharmaceuticals, polymers, semiconductors, forensics and life science. The new generation of Raman microscopes offers a non-destructive and non-contact method for fast sample analysis at the sub-micron level, providing the spatial distribution of the various molecular species within a heterogeneous sample.

High-definition Raman imaging may sometimes be seen as a time-consuming procedure as the image is generally obtained point-by-point by scanning the sample using a motorized stage or piezo actuators. However recent advances in Raman instrumentation have opened the realm of fast chemical imaging at very high resolution.

A novel scanning technique with nanometric accuracy and reproducibility will be presented in details with in mind obtaining high quality chemical images with reduced acquisition times. The advantages of such techniques will be illustrated by a few examples.

Finally, several imaging schemes will be presented that push the spatial resolution of the technique to its limits.