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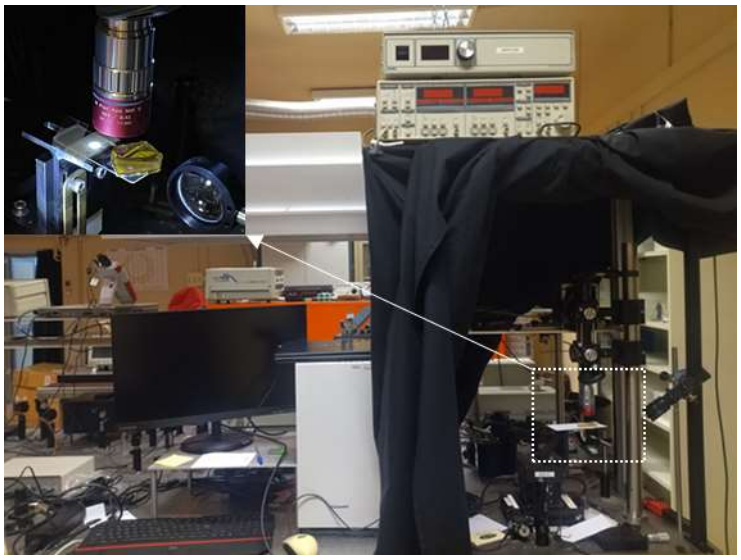
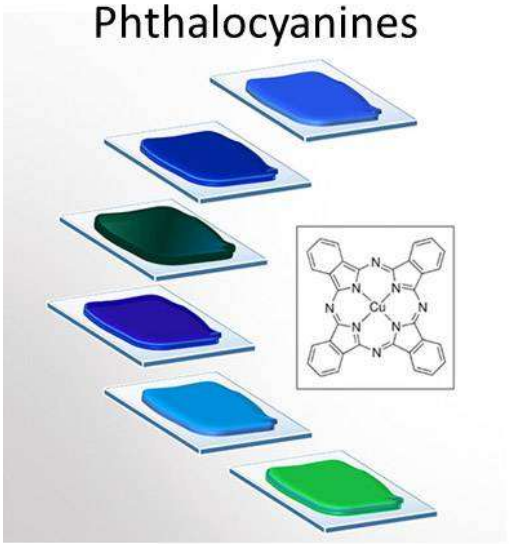
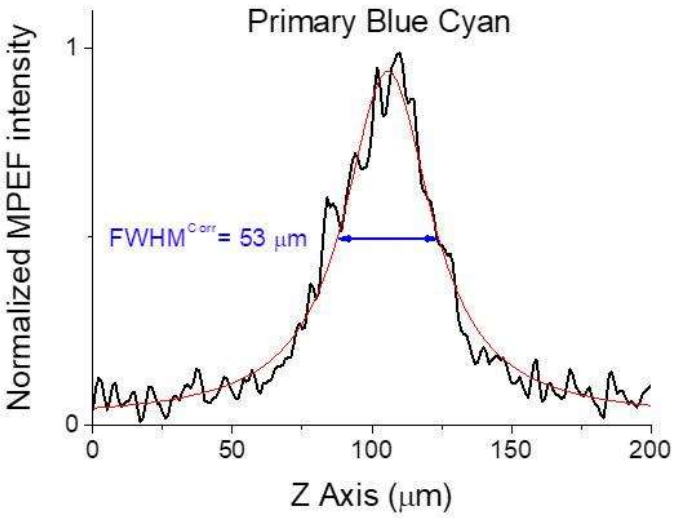
FIXLAB

LLHS, IQFR-CSIC. Non-linear Optical Microscopy (NLOM)

Description







Spectrochim. Acta A 208 (2019) 262-270.

NLOM is based on the excitation of the non-linear optical response that any material can generate upon excitation with laser pulses of very short duration, in the range of femtoseconds. The NLOM system makes possible, throughout the combined use of the different modalities (Multiphoton Excitation Fluorescence, Second and Third Harmonic Generation), to acquire information, in a totally non-invasive way, on the presence of layers of different chemical nature, their thickness or their crystalline or hierarchical internal organization (i.e. parchment, starch glues, etc.). Lateral and axial resolutions are in the micrometer range and the penetration depth can reach up to 1 mm, depending on the sample transparency. The technique can be applied to substrates that are transparent in the IR region, such as varnishes, painting layers, corrosion layers on metal substrates, parchments and others.

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Fields of application

Cultural Heritage
Corrosion layers, decorative arts, film, manuscript, mosaics, painting, papyrus, parchment, photography, sculpture, textile, varnish

Materials

Inorganic
Ceramic, glass, stone, metal and metallurgical by-products, pigment
Organic
Binding media, glues, varnishes

Equipment

The The NLOM system consists in an upright microscope that uses an ultrashort laser system as the excitation light source. The laser is a mode-locked Ti: Sapphire oscillator emitting at 800 nm, delivering 70 femtosecond pulses at a repetition rate of 80 MHz. A variable neutral density filter is used to control the laser power reaching the sample to ensure non-damaging measurement conditions. The microscope is based on objective lenses with high numerical aperture. The sample, or object of study, is placed on a 3D motorized translation stage with micrometer resolution that selects the position of the focal spot of the laser on the sample. The lateral and axial resolution of measurements is 1 and 2 micrometers, respectively. The non-linear optical signal is collected in the reflection mode and measured with a photomultiplier and an adequate combination of optical filters. Signal discrimination is enhanced with the use of a lock-in amplifier.

Potential Results

The combined use of the different NLOM modalities derives information, in a totally non-invasive way, on the presence of layers of different chemical nature, their thickness, or their crystalline or hierarchical internal organization. It is possible to obtain highly contrasted 3D images at the micrometer scale, without any preparation or sampling, of the artifacts.

References

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Sample or service requisites

- Samples with a size equal to or greater than 2 mm x 2 mm.

For further details please contact the provider

Provider

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