PLIEGO DE PRESCRIPCIONES TÉCNICAS

“SUPPLY, INSTALLATION AND STARTING-UP OF A MICROSCOPE TO BE INTEGRATED TO CURRENT FTIR SYSTEM AT ICFO”, MEDIANTE EL PROCEDIMIENTO ABIERTO SIMPLIFICADO PREVISTO EN EL ARTÍCULO 159.6 LCSP

NÚMERO DE EXPEDIENTE: 2022.SU.004

Necesidades a satisfacer

We need the purchase and installation of a microscope for our currently operating Nicolet isr50 FTIR system. This microscope will allow us to perform FTIR spectroscopy in photonic microstructures (gratings, microststructured semiconductors) that will allow us to characterize photonic cavities and gratings for infrared optoelectronics (Lasers, LEDs, photodetectors). Moreover we will use the microscope in order to achieve focused beam excitation to align with infrared photodetectors in order to measure their spectral response using the step-scan mode of our current FTIR system.

Technical specifications:

The specifications of this microscope should be as follows:

System Optics

The IR microscope must be fully configurable for optimized sample viewing and infrared spectral purity providing multiple magnification optics, pre- and post- sample apertures and spherical aberration compensation optics. It must be fully customizable with various options for visible illumination enhancement (polarizer, DIC, fluorescence kit) and infrared acquisition multiple experiments (higher magnification optics, ATR slide-on or dedicated objectives, side port reflectance for large samples, heated stage, etc.). Advanced configurations must provide full control of microscope automation for collecting and analyzing chemical images using a single software package. The microscope should be compatible and demonstrated to work (in terms of software and hardware) with the FTIR tool that is currently installed in our facility (Nicolet iSR50).

1. The IR microscope must be **infinity corrected** providing the best visual clarity in visible mode, uniform focus across the full field of view and optimal design for optional optical devices (Differential Interference Contrast) and illuminations (Fluorescence).
2. The aperture design of the IR microscope must provide **masking before and after the sample** for best spectral purity and superior spatial resolution. The aperture must be electronically controlled, adjustable and rotatable by using manual or optional software controls. For perfect match of pre-post sample masking the IR microscope design must provide dual apertures by using a single double-pass device. The aperture must allow full field sample viewing with x, y and θ adjustable positioning through independent dedicated illumination.
3. For best visual clarity of details and optical spatial resolution performance the IR microscope must provide **independent electronically controlled white light** (Koehler) transmission and reflectance illumination with independent field stops and source iris illumination controls for highest quality imaging and contrast control. White light **illumination must also be independent from the infrared optical path** allowing different combinations and usage for infrared transmitting samples that are opaque to transparent (silicon wafers or thin slices) in the visible range and for transmission illumination of non-infrared transmitting devices (low-e glass slides) equipped with infrared reflection coatings. LED illumination is not desired.
4. The IR microscope must have a **trinocular** with a video camera allowing simultaneous direct observation through the eyepieces and computer video capture of the sample image.
5. Video camera must provide high resolution, noise free image by using **color CCD digital devices**. The image transfer should be preferably through USB 3, with no need for video capturing hardware.
6. The infrared and visible objectives must be mounted in **demountable nosepieces** (single place, four place, or single place sideport reflectance) allowing multiple magnification optics

and infrared objectives to be quickly exchanged with no realignment. Fixed objective magnification is not desired.

7. The infrared **condenser must be demountable** and available for 15X and 32X magnification to match infrared objective magnification and numerical aperture for optimal infrared energy transfer. Fixed condenser magnification is not desired.
8. The sampling stage mount must be compliant with **manual or optional mapping, heating, or rotatable** stages.
9. The IR microscope detector compartment must be designed for **single or optional dual detector operation** (software controlled). A wide range of detectors must be available including wide, narrow and mid-band MCT, 50 micron element MCT for smaller samples and a near IR detector, InGaAs for Near Infrared operation. The MCT detectors must include a stainless steel body providing an **18 hour liquid nitrogen hold time** and preventing ice formation on the MCT element.
10. The IR microscope must incorporate **continuous view of the sample** and surrounding medium through both the eyepieces and video display **even during data collection**. The optics must provide a full field of view of the sample and the **aperture must be visible without obscuring the field of view**. The aperture should be invisible except when an image is projected onto the sample by remote illumination. Partially transparent glass apertures in the viewing field are not desirable. Even a fully manual IR microscope configuration must allow “real time” spectral data preview mode while moving the sample stage and displaying the aperture size. Also being able to simultaneously run spectral search of the currently displayed spectrum with no need for image mosaic collection, infrared mapping, mapping stage or spectral data full acquisition. The IR microscope must provide a true “what you see is what you get” capability. Manual switching between visual viewing to IR data collect is not desired.
11. The IR microscope must include Infrared/visible 15X and 32X (optional) objectives and condensers that must provide either fixed or continuously variable **spherical aberration compensation** to perfectly match the visible and the infrared focal plane when using infrared transparent supports like salt windows or diamond compression cells.
12. An optional dedicated **ATR objective** must provide the capability to **see the sample when in contact** with the ATR crystal element showing the exact contact location. Electronic control of the pressure applied to sample with LED indicators must be provided with ATR objectives.
13. Optional **slide-mounted ATR crystals** must be easily **exchangeable** with no need for tools or realignment providing **ease of cleaning** and **penetration depth studies** capability (germanium and silicon crystals must be available as well as conical shape Ge crystal for the analysis of samples in recessed areas). The slide mount must be provided with a quick-release device and a locking system for **precise crystal centering** reproducibility. Electronic control with LED indicators of the pressure applied to sample must be provided with ATR slide attachments. Slide On ATR objective must provide **transmission, reflection and ATR** analysis sampling modes.
14. The **optional side port** must provide reflectance and slide-mounted ATR capabilities on a side (left or right) or on the front of the microscope allowing the infrared microscopy analysis on large sample surfaces when the sample size does not fit the stage area clearance.
15. An **optional Grazing Angle Objective** provides the capability to measure sub-micron layers of materials deposited on reflective surfaces.
16. The IR microscope must be equipped with slots for **optional optical devices including DIC** (differential interference contrast) to enhance the optical image contrast and detail of white light transparent or translucent samples adding color and three dimensional effects, a **fluorescence illumination kit** to identify specific areas or components of the sample, **visible polarizers and infrared polarizers**.
17. The IR microscope must be configurable from fully manual to fully automated including aperture, stage, focus and automated ATR contact controls.
18. The offer should include a liquid nitrogen cooled MCT -A detector with spectral range from 600 – 11700 cm-1 and the associated liquid N2 dewar.

19. A sampling stage to place the samples that must be compatible with operating using a cryostat stage (e.g. a Linkam cryostat stage).

Software

The IR microscope optional software must include integrated video image collection and a software ruler (to measure sizes and distances) with the ability to annotate and print video images, save video images and cut/paste operations for report generation. The optional infrared imaging software must provide physical and chemical information extraction tools including: **chemometric analysis** (Principal Component Analysis and **PCA reconstruction**, **Multivariate Curve Resolution (MCR)** and **RGB** analysis); classical chemical analysis (peak analysis or ratio, functional groups, spectral correlation) and **image analysis** applicable to infrared or video image (binarization, filtering and measurement of particles or fiber size, distribution, center of mass or other physical properties). The software must also include a fully integrated and interlinked displaying of spectral data, contour display (2D), tri-dimensional display (3D) to display hyperspectral surfaces.

Sampling Accessories

Sampling Kit: Standard sampling kit includes micro sampling blades, micro sampling probes, micro sampling tweezers, roller-knife, pin-vise with sampling needles, 3 position sample slides, and a 100 micron pinhole sample with a gold mirror reflectance reference.

Other

Upgrade: Fully field upgradeable to video microscopy, dual detector, trinocular viewer, auto aperture, auto focus, automated precision stage and automated data collection.

Training and Installation

The offer must include transport, installation and system training to ICFO group members.

Warranty

1.1. Minimum 2 year warranty.
1.2. Spare parts must be available during, at least, 10 years after system supply.

CE MARKING

Target price

57.000,00 EUR (VAT excluded).

Delivery Time

Delivery time maximum 12 weeks:

- Delivery time is defined as the time elapsed since the signature of the contract until the system delivery at ICFO facilities. It includes the manufacture of the system, the acceptance test at company's premises and the transportation.

Castelldefels, a 8 de febrero de 2022

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