Instrument model and characteristics

High Resolution Triple Micro-Raman system, model T-64000 (Jobin Yvon).

Laser sources
(a) Water-cooled Argon ion laser (Spectra physics Model 2017, 5W all lines) operating at 457.9-514.5 nm
(b) Air-cooled Ar+ laser (Spectra Physics, Model 163-A42, 60mW) at 514.5 nm
(c) Ti-sapphire laser CW tuneable laser (Spectra Physics, Model 3900S) operating at 675-1100 nm
(d) He-Ne laser (Melles Griot, Model HLA-20P) at 632.8 nm
Collection angle: 180^{o}
Microscope: Olympus BHSM-BH2 metallurgical confocal microscope
Spectrometer: T64000 (single or triple monochromator configurations) spectrometer with 600 or 1800gr/mm gratings
Detector: Spectraview-2DTM liquid N2-cooled CCD detector
Other accessories:
- Microscope cryostat MicrostatN (Oxford Instruments S.A.; temp. range: 77K-500K)
- Temperature controlled furnace under microscope working up to 350^{o}C
- XY-motorized stage (78x55 mm, minimum step size 0.08 mm)

Point Illumination Raman Imaging using the T-64000 spectrometer (Jobin Yvon)

The sample is moved under the static illuminated spot of the long working distance (8mm) 50x/0.55 microscope objective using the XY-motorized stage. For each point on the sample the CCD detector collects a single spectrum. The sample is displaced in small increments depending on the desired spatial resolution (max ~1 mm) until the necessary area is mapped. The Raman scattered light is collected to form a file containing a Raman spectrum for each individual sample point. The computer is programmed to make a map of the surface. This map should show the intensity of a given Raman peak, in other words, the presence (and/or the concentration) of certain chemical species or/and active site, at each point of the scanned surface.

High temperature Raman System

Laser sources: Water-cooled Argon ion laser (Spectra physics Model 2017, 5W all lines) operating at 457.9-514.5 nm
Collection angle: 90^{o}
High temperature systems:
- Home made high temperature optical furnace having four optical windows working up to 1100^{o}C controlled by a temperature controller
- A 240W CO_2 laser (Synrad, Evolution series E240) for working at temperatures up to 2500^{o}C
Spectrometer: T64000 (single or triple monochromator configurations) spectrometer with 600 or 1800 gr/mm gratings
Detector: Spectraview-2DTM liquid N2-cooled CCD detector

Other accessories: Variable temperature liquid nitrogen cryostat OptistatDN-V (Oxford Instrruments S.A.,; temp. range: 77K-500K)

UV Raman system

Laser source: Air-cooled HeCd laser [Kimmon Electric Co. (Dual, 325/442 nm, UV/blue, 20/80 mW, IK5651R-G model laser]
Collection angle: 180^{o}
Microscope: Olympus BXFM-ILHS
Spectrometer: HR 800 spectrometer with 2400gr/mm gratings
Detector: Spectraview 2D liquid N_2 - cooled CCD detector
Other accessories: connection with the ultra high temperature (up to 2500^{o}C) system

Custom-made Flexible Micro-Raman System with no moving parts

Laser sources: Small Nd-YAG laser, working at 532 nm (60 mW) properly attached to the Raman probe
Micro-probe: Modified Dilor Super Head specially designed to enable remote selection of all possible polarization combinations of the incident and scattered radiation
Collection angle

180°, backscattering is achieved by reflection on a small right-angle prism; the beam is then expanded and collimated through a 50x long working distance microscope objective
Fiber optic cable
The Raman scattered beam is focused in the core of an armored optical fiber (100 μm in diameter) and delivered to the monochromator. The length of the optical fiber gives the ability to detect and manipulate signals 10m away from the area of measurement. Optical fiber of lengths up to 100m could be used as well, depending on the experimental requirements.
Spectrometer: HE532 Monochromator with fixed 920gr/mm concave grating, 20 cm focal length
Detector: Peltier cooled 2D-CCD detector
The flexible micro-Raman set-up is able to perform in situ Raman measurements ANYWHERE

FT-Raman System
Laser sources: R510 diode pumped Nd-YAG laser operating at 1064 nm (~500 mW)
Collection angle: 90°, 180°
Spectrometer: EQUINOX 55 equipped with Bruker (D) FRA-106/S component
Detector: High sensitivity liquid N2-cooled Ge
The near infrared excitation allows the registration of fluorescence-free Raman spectra

Contact Person:
Dr. G. Voyiatzis

Conventional Micro Raman set-up
Laser sources: 514.5 nm, Argon Ion, Lexel lasers
Spectrometer: 0.65 m SPEX spectrometer with grating of 1800 gr/mm
Detector: Air-cooled CCD camera, Wright Instruments
Spatial resolution: 1 μm
Confocal Nikon Modified Remote Raman Micro - probe (laser source @ 514 nm) In-situ measurements via fibre optic cables
Remote Raman probe Dilor Confocality, Polarizer, analyzer, internal laser source @ 532 nm
In-situ measurements via fibre optic cables

Invia Reflex Raman spectrometer
Laser sources: Dual laser (514 nm and 785 nm) excitation
Microscope: Specially adapted Research Grade Leica DMLM microscope
Spectrograph:

- High efficiency and throughput spectrograph : 250 mm focal in length
- Rayleigh line rejection filter set for 514 and 785nm excitation
- Raman spectrum to 110 cm-1 from the laser line
- Encoder feedback controlled grating stage with dual gratings (1800 lines mm-1 and 1200 lines mm-1) on interchangeable magnetic kinematic mount)

Detector: Peltier cooled CCD array detector near infrared enhanced
Other accessories:

- “Easy confocal” facility using motorised slit (2.5 μm depth resolution using a x100 objective)
- Motorized neutral density filters offering 16 different power levels
- Polarization analysis kit for BOTH laser lines

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