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Product note from the Spectroscopy Products Division

RENISHAW
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Near-Excitation Tuneable filter (NExT)
Low frequency Raman spectroscopy

New opportunities

Near-excitation Raman spectroscopy enables you to get information that you cannot get from standard benchtop Raman systems using notch and edge filters.

Near-excitation studies can reveal information about:

- low energy conformational changes (such as hindered rotations and structural isomerism in biological samples, and polymorphism in pharmaceuticals).
- lattice modes in crystals (e.g. acoustic modes in polymers that reveal crystallite sizes of lamellae, superlattice modes in advanced semiconductor devices).
- vibrations of compounds containing heavy atoms (such as the heavy halides used in incandescent lamps).
- rotational behaviour of gases (leading to bond length determination, for example).

Near-excitation Raman spectroscopy provides this information far more easily than the competing techniques of far-infrared absorption spectroscopy and inelastic neutron scattering.

Far-infrared absorption spectroscopy is severely hampered by the poor performance of far-infrared detectors such as bolometers, and often requires the use of expensive specialist light sources such as synchrotrons.

Inelastic neutron scattering has the significant disadvantage of needing a nuclear reactor or particle accelerator as a source of neutrons, and has a limited number of applications as only hydrogen and deuterium give appreciable neutron scattering.

In addition, neither far-infrared spectroscopy nor inelastic neutron scattering have the high spatial resolution possible with Raman microscopy (lateral resolution < 1 µm).

The best of both worlds

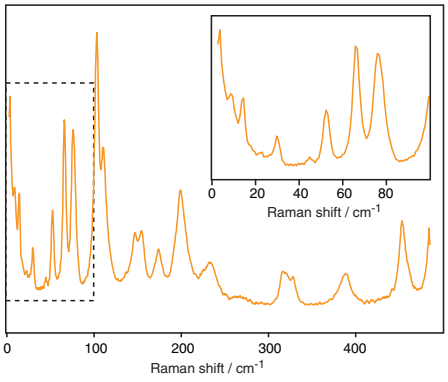
Renishaw enables you to make both standard and near-excitation measurements on the same instrument.

The standard excitation rejection filters in Renishaw's Raman microscopes (holographic notch or dielectric edge filters) are optimised for very high optical efficiency. This results in minimum exposure times for the majority of samples.

NExT filter equipped Raman microscopes can use their very high optical efficiency dielectric or holographic filters for the majority of measurements, switching to NExT when near-excitation Raman studies are required.

Renishaw's computer-controlled optics make this change simplicity itself, and their precision movement enables both standard and near-excitation spectra to be taken from the same position on the sample.

In this way users have the best of both worlds; very rapid acquisition of full range Raman spectra, and the acquisition of near-excitation spectra, in the same instrument, and if necessary from the same position on the sample.



NExT spectrum of l-cystene, with expanded view of the low Raman shift region (inset).

New opportunities

New capabilities.
New applications.

The best of both worlds

Use NExT and ultra high efficiency notch and edge filters on the same instrument.

Tuneability

Only one filter needed for multiple excitation wavelengths.

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Tuneability

Renishaw's NExT filter comes in ultraviolet, visible, and near-infrared variants, each of which can support several different excitation wavelengths.

Samples sometimes require different excitation wavelengths to get the best spectra, so multiple-laser equipped microscopes from Renishaw are becoming increasingly popular. The proprietary optical design of NExT filters allow them to be tuned to match the emission wavelengths of several lasers within their operating band (ultraviolet/visible/near-infrared).

Now or later?

A NExT filter can be fitted to one of Renishaw's Raman microscopes at the time of purchase, or can be fitted later, when requirements change.

This flexibility is a key part of Renishaw's Raman philosophy; the best performance without sacrificing flexibility.

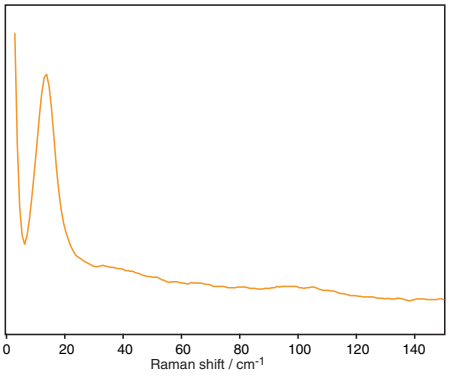
By choosing a Raman microscope from Renishaw you will be able to satisfy not only your current measurement requirements, but also changing future requirements.

Typical specifications

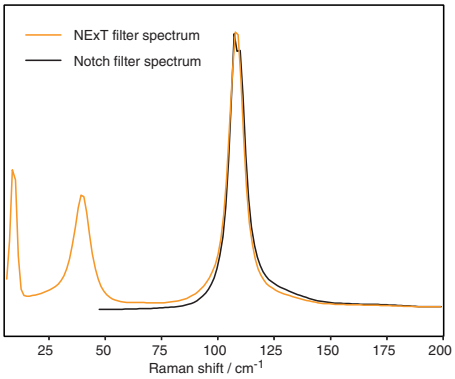
	Excitation wavelength		
	633 nm (visible)	514 nm (visible)	325 nm (UV)
Spectroscopic parameters			
Low wavenumber limit[a,b] / cm^{-1}	< 10	< 12	< 40
Optical density at excitation wavelength	> 8	> 8	> 8
Typical spectral range in one exposure[c] / cm^{-1}	450	800	1450
Operating conditions			
Temperature range	15 °C to 30 °C		
Humidity range	0%RH to 95%RH non-condensing		
Storage and transport			
Temperature range	0 °C to 40 °C		
Humidity range	0%RH to 95%RH non-condensing		
Miscellaneous			
Warranty	12 months		

Notes

a Cutoff defined at 10% transmission values
b Depends on configuration chosen
c Depends on grating



NExT spectrum of a longitudinal acoustic mode from the polyethylene polymer Rigidex-9.



Spectra of cadmium (II) iodide (CdI_2) taken using holographic notch filters and with a NExT filter. Note the two low wavenumber bands that are only visible in the NExT spectrum.

Acknowledgments

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