Программное обеспечение Fluoracle
Технические характеристики

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Россия +7(495)268-04-70
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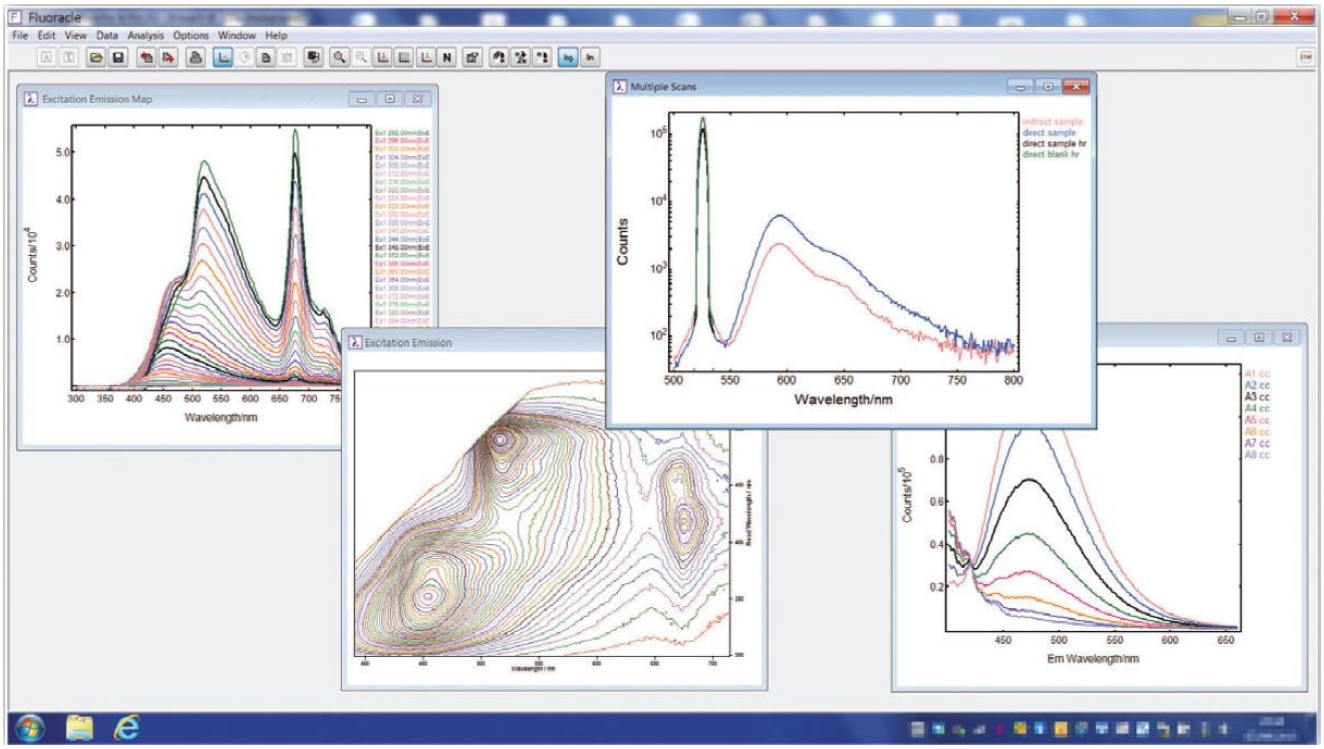


Fluoracle Software

Fluoracle controls all FS5, Mini-tau and FLS1000 series of steady state and time-resolved spectrometers and features a straightforward design concept:

“to focus on all modern photoluminescence spectroscopy applications whilst providing a user-friendly interface with ‘ready to publish’ outputs”

Product Description

Fluoracle® is an exceptional software package specifically written to handle data and instrumentation in fluorescence spectroscopy.

Fluoracle is the successor of the proven F980 software from our FLS980 product line and it is this that provides the backbone to Fluoracle.

Whether you select a basic spectral scanning version of one of our spectrometer systems, or you go for an advanced version that includes TCSPC lifetime measurements, or integrating sphere measurements, the software will provide all instrument options automatically, from data acquisition to analysis and presentation.

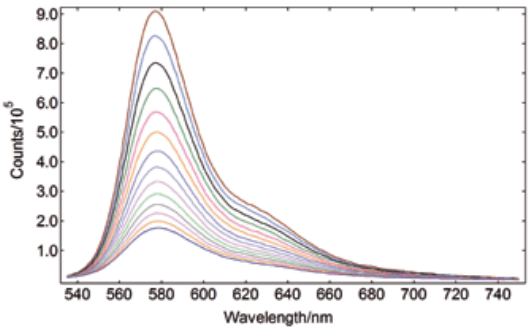
Fluorescence Lifetime Imaging Microscopy (FLIM) acquisition and analysis are

included in Fluoracle with a MicroPL upgrade.

Measurement Examples

Emission Scans – with temperature dependence

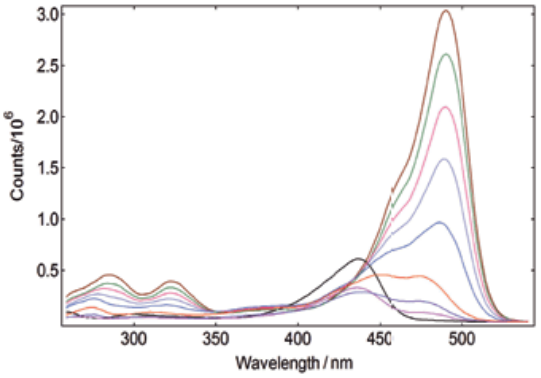
Rhodamine B, unlike other Rhodamine derivatives, has a chemical structure that is not entirely rigid. Consequently, the diethylamino groups interact with the solvent's temperature, affecting the molecule's excited-state population and dynamics through torsional motion. This causes the fluorescence intensity to have a strong dependence on the sample temperature, which can be seen below as measured with the TE cooled sample holder.



Rhodamine B in water, OD at 525 nm = 0.1, Spectral Band width: 2.5 nm, integration time per point: 0.1 s, Temp Accuracy Band: 0.5°C, Temp Stabilisation Time: 10 min

Excitation Scans – with pH dependence

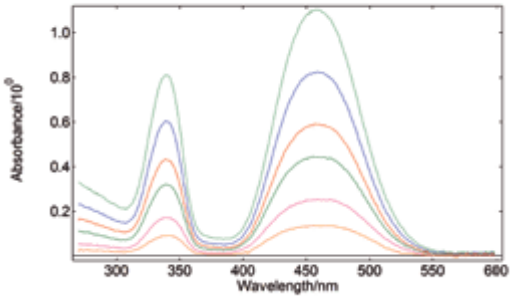
Fluorescence excitation spectra are more selective than absorption spectra, as they reveal, by virtue of the selected emission wavelength, where the molecule can absorb photons to prodcue a particular emitting species. Accurate excitation spectra require a sensitive instrument, as the concentration of the sample must be kept low to avoid inner filter effects, and require reliable spectral correction to ensure proper spectral representation.

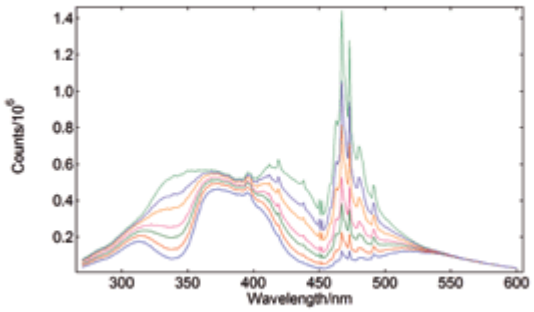


Fluorescein in water with pH 2 – 7 adjustments. Spectral Band width: 1.5 nm, integration time: 0.1 s, pH adjusted between pH= 2 (blue shifted spectrum) and pH = 7 (spectrum of maximum intensity)

Synchronous Scans – with concentration dependence

In synchronous spectral scans, the excitation and emission monochromators scan at the same time with a fixed wavelength offset, typically from 0 – 20 nm of offset pending the application. For dilute mixtures, this type of scan is used to identify species with a strong overlap between absorption and emission. Synchronous scans, together with the integrating sphere attachment, can also be used to measure the transmission/reflectance/absorption spectra of strongly scattering powders.

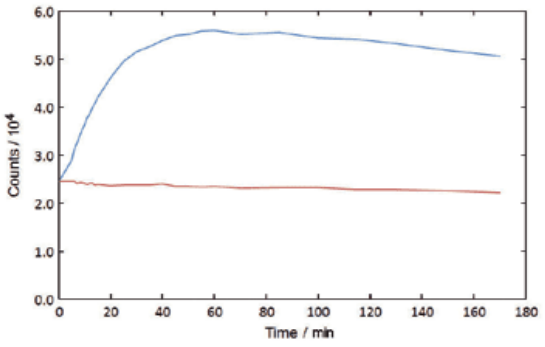




YAG: Ce powder, diluted with BaSO4 to study the effect of re-absorption/emission, concentration change from 100% down to 20%. The software wizard is used to calculate the Absorbance (left) from the raw data of synchronous scans (right).

Absorption Scans / Kinetic Scans

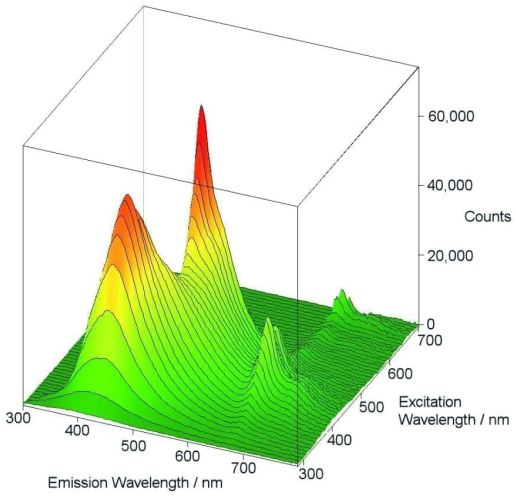
The time course of a fluorescence signal and, at the same time, the signal transmitted through the sample can be recorded. This enables experiments to be performed with chemically or biologically unstable samples, or with samples where very small changes need to be measured very accurately. The transmission detector is standard in all Edinburgh Instruments' spectrometers.



Caspase Assay, fluorescence time course recorded for a 100% enzyme addition (blue) and a 0% enzyme control (red). Peptide cleavage is recorded by an organic dye excited at 400 nm, emitting at 460 nm.

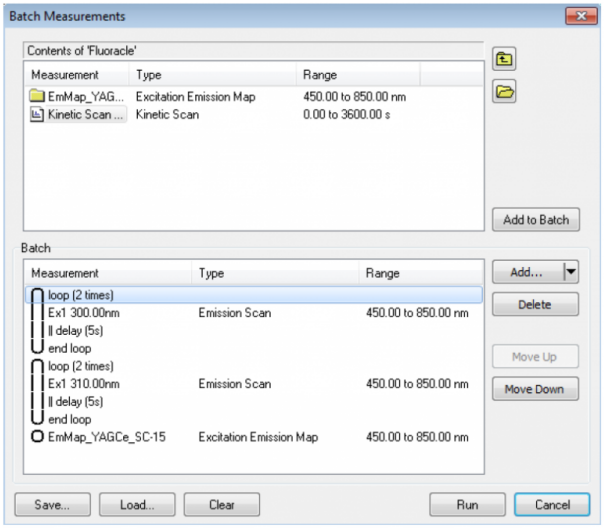
Excitation-Emission Maps

Excitation-Emission Maps (EEMs) provide a ‘Finger Print’ of complex mixtures of substances. These maps are typically measured either by a series of emission scans with stepwise increase, or for synchronous maps, by a series of synchronous scans and stepwise increase of the excitation-emission offset. A map measurement over a wide range of excitation and emission wavelengths, as shown here, can only be performed properly if higher order scatter is automatically removed during the measurement; built-in automatic filters, along with real-time correction for background noise and spectral efficiencies, allow these measurements to be seamlessly performed by even the newest users.



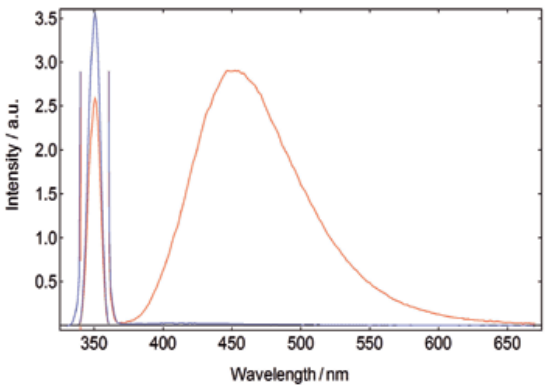
Batch Measurements (Batch Mode)

Combinations of excitation, emission, synchronous scans, excitation-emission or synchronous maps can be run in Batch Measurements. This means that several scans can be set for a sample and measured automatically without the presence of the user. The scans can be set to repeat in loops as many times as required, with a fixed pre-set delay between each scan. The batch measurements (protocols) can be saved and loaded for future use.



Measurements of Absolute Fluorescence Quantum Yield

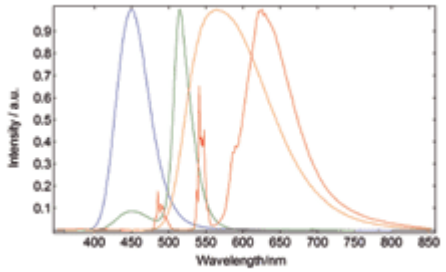
Fluorescence quantum yields can be measured by using the optional, sample chamber mounted, integrating sphere. The absolute method directly compares the number of absorbed and emitted photons through measurement of a blank-reference and a sample where their spectra can be integrated with respect to each other. The quantum yield calculation is made using a wizard within the operating software.

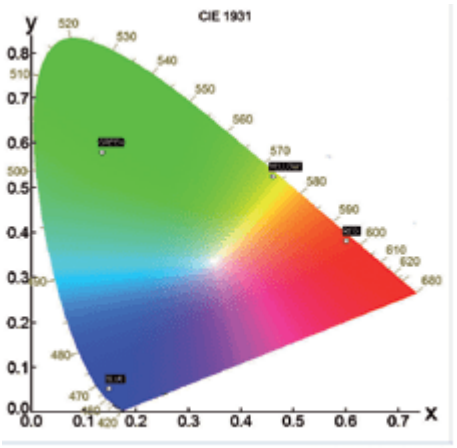


Quinine bisulphate in Perchloric acid. The red curve shows the scan over the excitation scatter at 350 nm and the emission of the sample, the blue curve shows the scatter of the blank measurement. The sample and blank-reference emission range (370 – 700 nm) has been increased by a factor 100 for better demonstration.

Chromaticity and Colour Co-ordinates

The lighting industry requires precise determination of the colour co-ordinates of fluorescent powders. Our spectrometers and Fluoracle software provides chromaticity analysis tools for the determination of colour co-ordinates and luminosity values using CIE 1931 and CIE 1976. The example shows four commercial powders with blue, green, yellow and red emission.

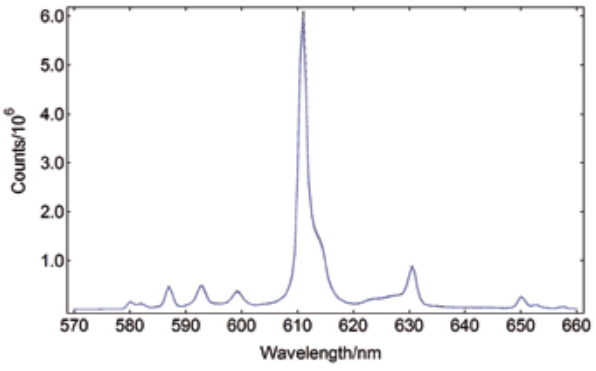


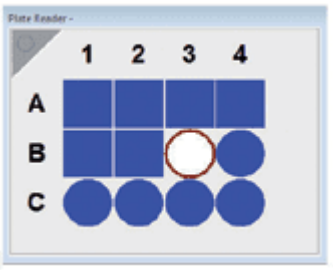


Show/ID	Name	X	Y	I
1	BLUE	0.14888	0.05283	2.435E-005
2	GREEN	0.13487	0.57890	1.036E-004
3	RED	0.60068	0.38197	7.201E-005
4	YELLOW	0.46109	0.52544	3.103E-004

Plate Reader

Multiple sample measurements can be made using the plate reader sample holder accessory. This can be used for liquid samples with commercial plates of up to 96 wells, but is also suitable for routine quality assessment of fluorescent powders. As with all the sample holder accessories, this is also compatible with all upgrade options, including the lifetime upgrades.





Technical Specifications

Software Functionality for Steady State Spectroscopy		
Measurement Modes	**Control Features**	**Data Manipulation and Display**
Signal rates	Wavelength selection (λEX & λEM)	Arithmetic (+ , – , × , / , append)
Excitation spectra	Grating selection	Scaling / multiplication factor
Emission spectra	Spectral bandwidths	Normalise
Anisotropy spectra	Integration time per data point	Baseline subtraction
Kinetic measurements	Sample selection (multi-position sample wells)	Crop range
Synchronous spectra	Programmed excitation shutter	Smooth
Corrected spectra	Programmed attenuator	2D, 3D, Contour and text
Temperature resolved spectra map	Source and detector selection	Grid ON / OFF
Synchronous spectra map	Online spectral data correction	Differentiation / Integration
Excitation-emission map	Post acquisition spectral correction	Peak search
Sample temperature monitoring	Polariser selection and orientation	Correction
Reflection measurements	X-Y Sample stage control	Anisotropy (G factor corrected)
Absorption measurements	Sample temperature control	Logarithmic / linear scales
Absorptance	Sample selection (multiple cuvette holders)	Comprehensive measurement and file properties for record keeping

Software Functionality for Steady State Spectroscopy		
Reflectance	Temperature control of sample holders	Data manipulation and ASCII / CSV output
Batch measurements	Detector gating for phosphorescence spectra	Cursor locations
Absolute quantum yield measurements	Cryostat control	Join, split and extract frames
Multiple sample position and well-plate measurements	Microscope stage control	Spectral correction wizard
Service scans	Plate reader control	Absolute quantum yield wizard
	Titrator control	Chromaticity calculation and display wizard

Software Functionality for Time-Resolved Photoluminescence Measurements		
Measurement modes	**Control Features**	**Analysis Features**
Signal rates	Wavelength selection for excitation and emission monochromators	Full data reconvolution using a non-linear least square fitting routine:
Manual lifetime measurement	Sample selection (multi-position sample holders)	Exponential reconvolution or simple tail fit
Multiple lifetime measurement	Detector selection (up to 3)	1-4 independent exponential decay times, fixed or as free fit parameters
Instrument Response Measurement	nF920 flashlamp voltage, frequency control and gas pressure monitor	Shift parameters, fixed or as a free fit parameter
Time resolved excitation spectra	External Laser Triggering	Background fit, fixed or as a free fit parameter
Time resolved emission spectra	Programmable iris attenuator	Chi-squared goodness-of-fit test
Fluorescence anisotropy	Multiple sources	Weighted residuals, Durbin-Watson parameter

Software Functionality for Time-Resolved Photoluminescence Measurements		
Temperature controlled lifetime measurements	Polariser selection and orientation	Autocorrelation function
Sample temperature monitoring	Cryostat control	Anisotropy calculation
Multiple sample position and well-plate measurements	Measurement to peak counts or preset time	Time resolved spectra
	Forward or Reverse mode	
	CFD settings on START and STOP: threshold, zero crossing and divider	
	Channel Selection: 512 – 8192 channels (TCSPC) and 500 – 8000 channels (MCS)	
	Time Range Selection: 2.5 ns – 50 µs (TCSPC) and 5 ms – 1000 s (MCS)	

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