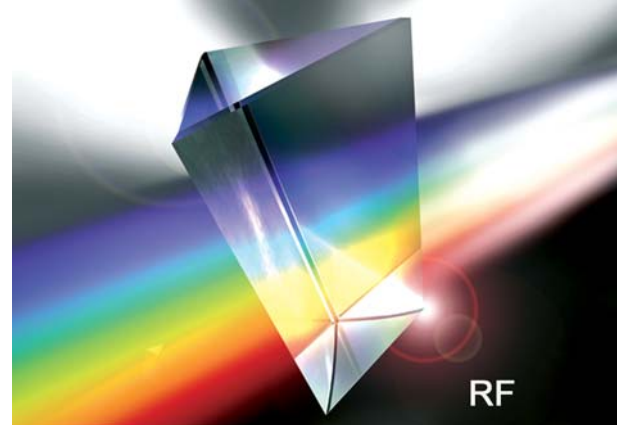


Application Note

Selectivity of the Fluorescence Spectroscopy using a known mixture made from Anthracene und Naphthalene



Regards the family of luminescence the fluorescence is the one which needs an external lightsource to be present. A single substance starts to illuminate or radiate (Fig. 1). The fluorescence is a straylight phenomena and will be detected in angle of 90 degree from the excitation wavelength. Fluorescence is used because substances representing for example a π -electron system can be excited by the input of energy. The electrons which are falling back from such excited state into the ground state emit energy. This energy can be detected with help of fitting measurement technique.



Fig. 1: View into the sample compartment of the Shimadzu RF-5301PC, inclusive solid sample holder and a Rhodamine B bloc, which was brought to excitation.

The selectivity of fluorescence spectroscopy will become visible because each π electron system reacts different depending on structure of the molecule with an own excitation wavelength

These π -electrons react selective, one analytical excitation wavelength will excite only one of the substances in a mixture..

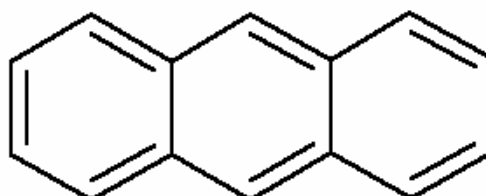


Fig. 2: Structure of Anthracene with formula $C_{14}H_{10}$

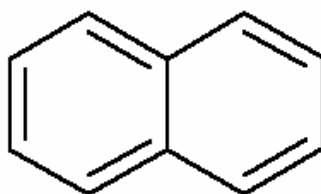


Fig. 3: Structure of Naphthalene with formula $C_{10}H_8$

Theme of this application is a standard bloc from company Starna. This bloc contains the substances Anthracene (Fig. 2) and Naphthalene (Fig. 3) in form of mixture prepared in a PMMA (Polymethylmethacrylate) matrix. In figure 2 and 3 the structures and formula are shown for both of the substances. Easily to recognize are the π electrons in the figures. The concentrations of the substances are defined as follows:

10^{-6} M Anthracene
 6×10^{-6} M Naphthalene,

M is equivalent to Mol concentration.

Instrument:

RF-5301PC with standard cuvette holder for 10x10 mm Cells,
PanoramaRF Software,
Resolution of 1.5 nm for Excitation and Emission mode measurement



Fig. 4: Shimadzu Fluorescence Spectrophotometer RF-5301PC

Analysis result

For the presentation of the selectivity of Fluorescence an „Excitation-Increment“ measurement was done. In a range from 250 to 400 nm the excitation was changed and measured stepwise in a distance of 1nm. Target of this trial is to identify the analytical wavelength of substances in a mixture. The result of such style of measurement will be presented in a 3D-View (Fig. 5). This figure shows 150 individual measurements.

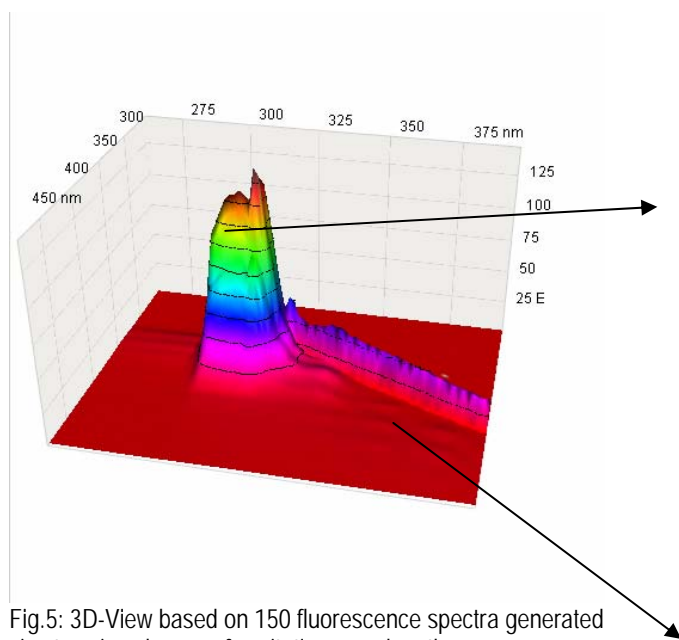


Fig.5: 3D-View based on 150 fluorescence spectra generated via stepwise change of excitation wavelength.

The figure is dominated from a signal with a maximum at 330 nm. This signal is identified to be Naphthalene. Using the spectra extraction method detailed information can be isolated from the 3D-Area. As result it is found with excitation wavelength 290 nm the spectrum of Naphthalene and at excitation wavelength 360 nm the spectrum of Anthracene.

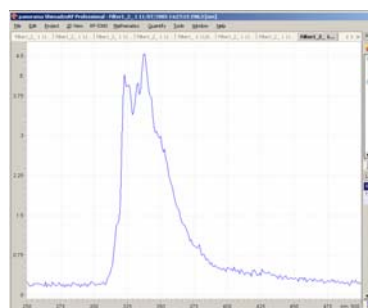


Fig.6: Fluorescence spectrum from Naphthalene, Excitation 290 nm and Emission 330 nm

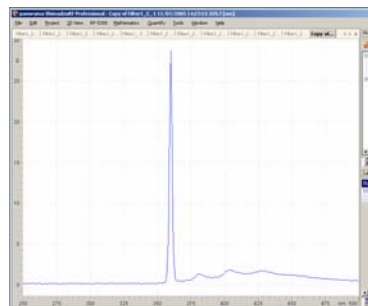


Fig.7: Fluorescence spectrum from Anthracene, Excitation 360 nm and Emission 402 nm

Result:

With the help of a 3D-presentation unknown samples can be easily analyzed and characterized finding the analytical wavelengths. A time consuming search of discrete wavelength is not more necessary. Clearly visible is in the 3D view the growing and decreasing of signals. This is to provide a basis for the selectivity which is attended to the fluorescence.

The given specification serve purely as technical information for the user.
No guarantee is given on technical specification of the described product and/or procedures.