THE USE OF THE TOTAL EMISSION ACCESSORY TO INCREASE THE SENSITIVITY OF THE MODEL LS-50

The PerkinElmer Model LS-50 Luminescence Spectrometer is a high sensitivity dual monochromator instrument, providing the user with a high degree of both selectivity and sensitivity. In certain cases the requirement for sensitivity is more critical than that for selectivity, for example when extreme sensitivity is sought or when the fluorescence spectral characteristics are well known and selectivity can be achieved using a cut-off filter to transmit the whole emission spectral envelope. (See Figure 1)

The symmetrical emission peak was recorded by scanning the emission monochromator. All of the emission envelope would be transmitted using the cut-off filter which transmits all wavelengths of light above 430 nm. Rayleigh scatter and 2nd order scatter are rejected since both are due to light at the excitation wavelength, this being absorbed by the filter.

Increasing sensitivity can be achieved in two ways: (i) by driving the emission monochromator to zero order or (ii) by using the total emission mirror accessory. The effect of zero order mode and the Total Emission Mirror accessory on sensitivity can be seen in Figure 2. Open circles and closed circles represent the increase in sensitivity afforded by zero order mode and total emission mode compared to that obtained in normal (dual monochromator) mode.

Note that optimal increase in sensitivity is obtained for a sample having a wide emission spectrum: very sharp spectral features such as the emission spectrum for ovalene do not allow as high an increase in sensitivity when using total emission. The increase observed is approximately 4-fold rather than the 10 to 15-fold increase observed with broad, featureless spectra.

Figure 1: Comparison of a fluorescence emission spectrum to the transmission spectrum of a suitable cut-off filter
Figure 2: Comparison of sensitivities obtained using different emission measurement modes of the Model LS-50