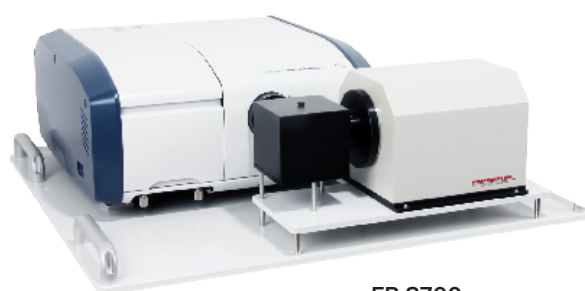


## Near-Infrared Phosphor Measurement

### Introduction

Near-infrared fluorescence labels are currently attracting the attention of the scientific community due to their wide range of biological applications. These labels are ideal for biological studies since biomolecules absorb very little in the near-infrared region. NIR fluorescence labels have shown no adverse effects in vivo and are highly stable.

This application note illustrates how the FP-8700 is used to obtain fluorescence spectra and quantum yields of phosphors in the near-infrared spectral region.



**FP-8700**  
Spectrofluorometer

### Keywords

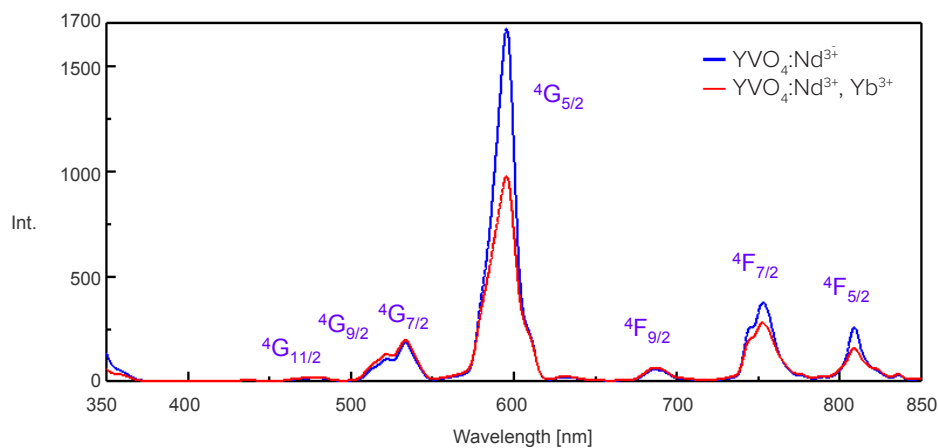
FP-8700, ESC-842 Calibrated WI light source, ILF-890 Integrating sphere, FPA-810 Powder measurement block, PSH-101 Powder cell, Fluorescence, Near-infrared, Quantum yield

### Experimental

Measurement Conditions			
Excitation		Fluorescence	
Emission Wavelength	883 nm	Excitation Wavelength	600 nm
Emission Bandwidth	10 nm	Excitation Bandwidth	10 nm
Excitation Bandwidth	10 nm	Emission Bandwidth	10 nm
Scan Speed	500 nm/min	Scan Speed	500 nm/min
Response Time	0.5 sec	Response Time	0.5 sec
Data Interval	0.2 nm	Data Interval	0.2 nm
Sensitivity	600 V	Sensitivity	600 V

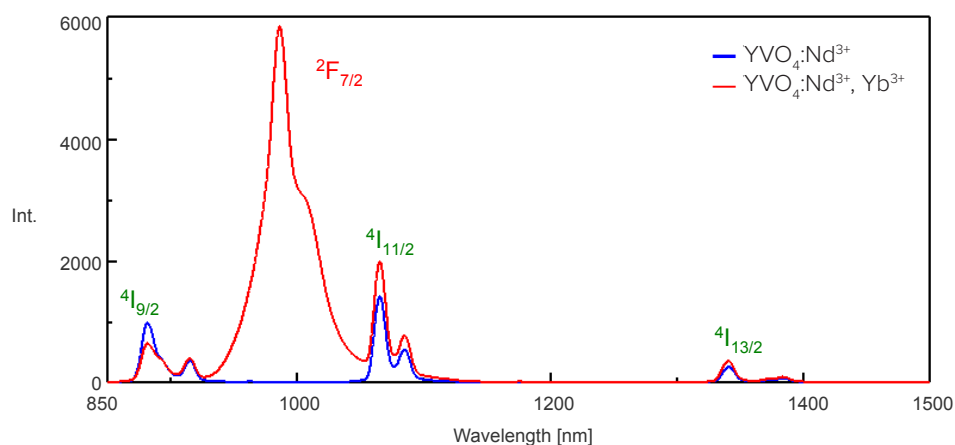
## Results

The excitation spectra of  $\text{YVO}_4:\text{Nd}^{3+}$  and  $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$  are shown in Figure 1 and the peaks are labeled with their corresponding excited state transitions from the ground state of  $\text{Nd}^{3+}$  ( $^4I_{9/2}$ ).



**Figure 1.** Excitation spectra of  $\text{YVO}_4:\text{Nd}^{3+}$  (blue) and  $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$  (red).

The fluorescence spectra of  $\text{YVO}_4:\text{Nd}^{3+}$  and  $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$  are shown in Figure 2 and the peaks are labeled with their corresponding transition states from the excited states of  $\text{Nd}^{3+}$  ( $^4F_{3/2}$ ) and  $\text{Yb}^{3+}$  ( $^2F_{5/2}$ ).



**Figure 2.** Fluorescence spectra of  $\text{YVO}_4:\text{Nd}^{3+}$  (blue) and  $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$  (red).

The quantum yields of both  $\text{YVO}_4:\text{Nd}^{3+}$  and  $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$  were calculated and shown in Table 1.

**Table 1.** Quantum yield results.

	Absorbance (%)	External Quantum Yield	Internal Quantum Yield
$\text{YVO}_4:\text{Nd}^{3+}$	9.0	2.5	28.5
$\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$	21.0	12.4	59.1

## Conclusion

This application note uses a FP-8700 to obtain fluorescence measurements in the NIR spectral region. This data is used to characterize near-infrared phosphors, which can later be used as fluorescent labels in biological studies.