

Near-Infrared Phosphor Measurement using FP-8700

Introduction

Near-infrared fluorescence label is getting paid attentions in several markets recently due to it's high stability and safety issue against human body.

Especially, these labels can be applied to biochemistry, Medical science and Life science.

In this application note, the excitation and fluorescence of samples as $\text{YVO}_4:\text{Nd}^{3+}$, $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$ are measured in near-infrared region and reported.

Keyword: Near-infrared fluorescent, Near-infrared fluorescent label, Internal quantum efficiency

Sample

$\text{YVO}_4:\text{Nd}^{3+}$, $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$

Measurement Condition

[Excitation spectra]

Ex wavelength range	350-850 nm	Em wavelength	883 nm
Ex bandwidth	10 nm	Em bandwidth	10 nm
Scan speed	500 nm/min	Response	0.5 sec
Data interval	0.2 nm	Sensitivity	600 V
Spectral correction	ON		

[Fluorescent spectra]

Ex wavelength	600 nm	Em wavelength range	850-1500 nm
Ex bandwidth	10 nm	Em bandwidth	10 nm
Scan speed	500 nm/min	Response	0.5 sec
Data interval	0.2 nm	Sensitivity	600 V
Spectral correction	ON		

Result

Excitation 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 excitation states from ground state of Nd^{3+} ($^4\text{I}_{9/2}$) are shown in here. Fluorescence spectra of $\text{YVO}_4:\text{Nd}^{3+}$ and $\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$ are shown in figure 3 and the energy deactivation from excitation states of Nd^{3+} ($^4\text{F}_{3/2}$) and Yb^{3+} ($^2\text{F}_{5/2}$) are also shown in here. The calculation result of Quantum yield are shown in table 1.

As a result, this near-infrared fluorescence measurements is an effective tool to develop the phosphor based on multicolor or transmittivity in physiological tissue.

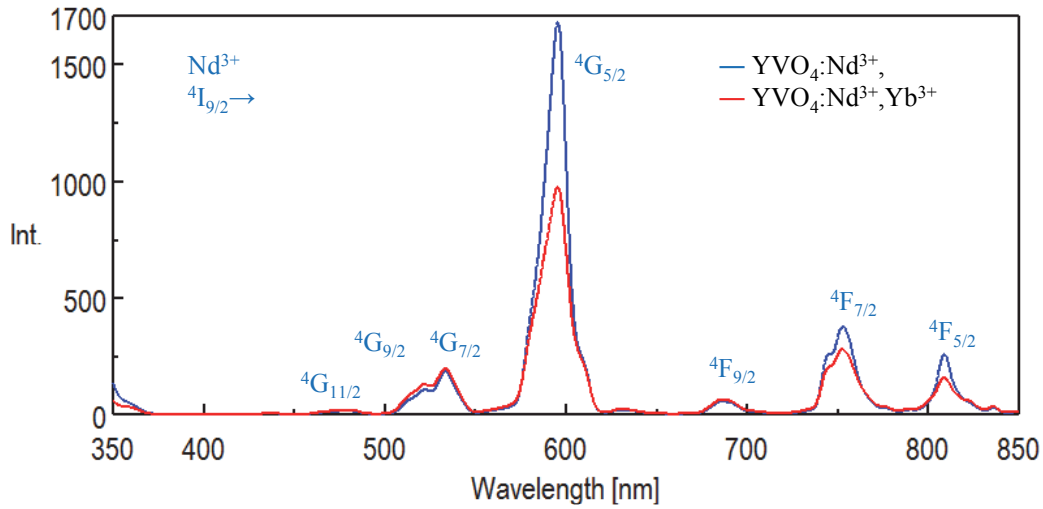


Fig.2 Excitation spectra of near-infrared phosphor

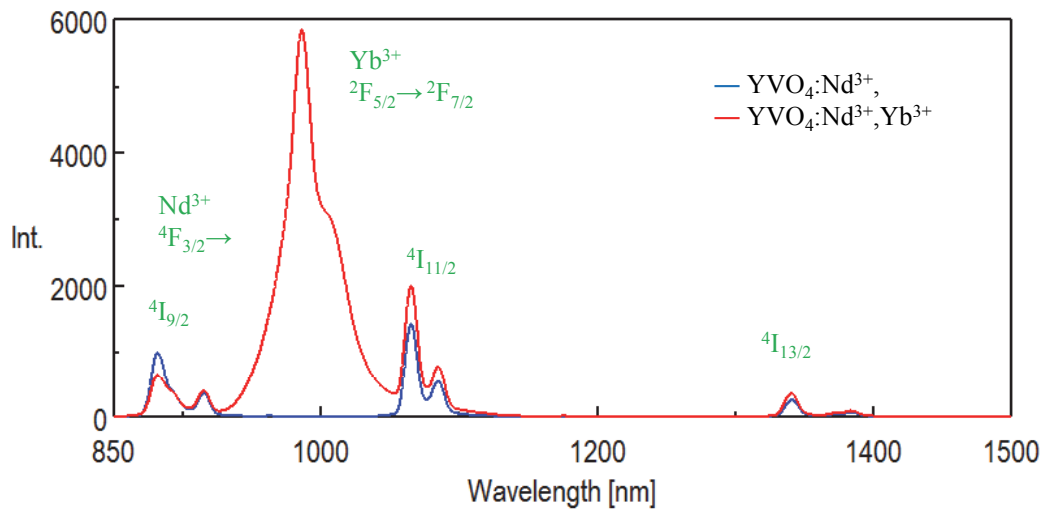


Fig.3 Fluorescence spectra of near-infrared phosphor

Table.1 Quantum yield calculation

	Absorbance [%]	Outer quantum efficiency [%]	Internal quantum efficiency [%]
$\text{YVO}_4:\text{Nd}^{3+}$	9.0	2.5	28.5
$\text{YVO}_4:\text{Nd}^{3+}, \text{Yb}^{3+}$	21.0	12.4	59.1