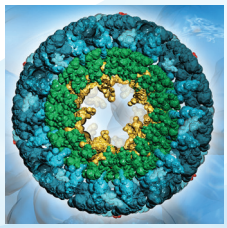
HORIBA Scientific

Fluorescence

UV-Vis-NIR Fluorescence Detection Wavelength Range from 250 nm to 1,100 nm



Application Note
Life Sciences

Figure 1: Duetta, a 2-in-1 fluorescence and absorbance spectrometer

Figure 2: SampleSnap-UNI solid sample holder for Duetta. This rotating stage holds thin films, slides, and other solid samples. Other attachments are available for powders and cuvettes for front-face measurements. Attachment shown is the SampleSnap-SS for holding slid samples such as glass, slides and films.

Introduction

Novel photoluminescent materials often have emission shifted more into the near-infrared wavelength region than many traditional fluorescent dyes and tags. For this reason, fluorescence spectral detection in the near-IR is more important than ever. Standard fluorometers with photomultiplier tube detectors will detect emission out to 850 nm, with the detector efficiency falling off steeply at wavelengths higher than 850 nm. With CCD detection on the Duetta 2-in-1 fluorometer and spectrophotometer, NIR spectral detection is easy and fast out to 1100 nm. Neodymium laser glass is used to demonstrate emission peaks both lower than 850 nm and higher than 850 nm to compare a standard PMT-based fluorometer to the NIR capabilities of Duetta.

Experiment and Results

Neodymium laser glass was purchased from Schott Glass North America. The glass was excited with 575 nm light and the emission spectra detected on both a standard PMT-based fluorometer and the CCD-based Duetta instrument. All spectra are shown with correction for lamp intensity and instrument correction factors. The piece of laser glass was held at 60 degrees relative to the excitation light path using the SampleSnap-SS solid sample holder on the SampleSnap-UNI variable angle tray.

Neodymium photoluminescence has multiple peaks ranging from 785 nm to a very strong peak at 1052 nm. The emission spectrum from the PMT-based fluorometer shows that the efficiency of that detector falls off sharply at 850 nm, cutting off the two strongest peaks at 890 nm and 1052 nm. All of these emission peaks, including the very small intensity peak at 785 nm was easily detected by Duetta, which uses a CCD as the emission detector. When both spectra were normalized to the emission peak at 820 nm, a peak that both detectors can measure, the relative fluorescence of the other peaks can be compared.

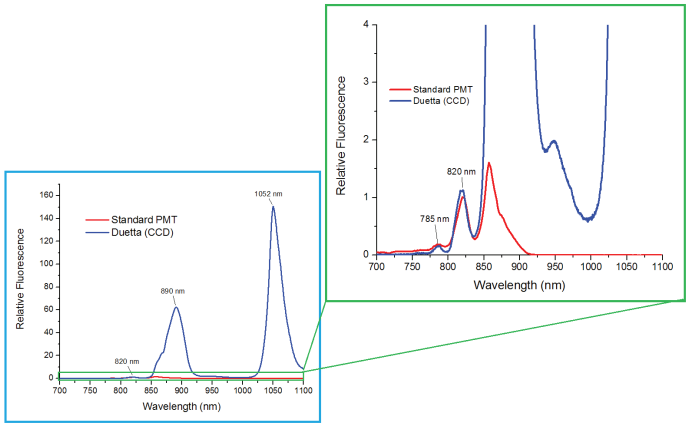


Figure 3: Neodymium laser glass emission spectrum. Ex: 575 nm, 5 nm band pass, Em: 700-1100 nm on fluorometer with PMT (red) and Duetta (blue). Standard PMT sensitivity falls off around 850 nm, while the Duetta CCD detector has sensitivity out to 1100 nm.

Conclusion

For photoluminescence and fluorescence measurements with emission higher than 800 nm, the Duetta is a powerful tool that differentiates from standard PMT-based benchtop fluorometers. Duetta is a superior instrument, using a CCD detector, for quickly measuring materials such as neodymium and other near-IR emitting materials, dyes and fluorochromes. The SampleSnap-SS attachment is useful for holding solid films, slides, and glass materials in this application space.

Instrument: Duetta

Accessories (Duetta): SampleSnap-UNI with SampleSnap-SS solid sample holder

Experimental Conditions (Duetta):

Ex: 575 nm

Em: 700-1100 nm

Total Integration time: 1 sec (Duetta),

0.1 sec*401 data points = 40.1 sec total (PMT-based fluorometer)

Emission increment (PMT-based fluorometer only): 1 nm

Sample Angle: 60 degrees relative to excitation light path

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