Application Note
FP-0023

Detection of Phosphorescence from Singlet Oxygen using NIR Spectrofluorometer

Introduction

While oxygen molecules are typically in a triplet ground state, if enough energy is delivered to the molecule they can be excited to produce singlet oxygen. However, this transition is forbidden and does not proceed directly, in which case a photosensitizer is used to induce a molecular reaction. Optical irradiation excites the photosensitizer from its singlet ground state to a singlet excited state. It then changes to a triplet excited state by intersystem crossing. If the energy difference between this triplet state and the singlet ground state for the photosensitizer is almost the same as that between the singlet excited state and the triplet ground state for oxygen, energy transfer occurs. As the triplet excited photosensitizer loses its energy, singlet oxygen is produced.

FP-8700 Spectrofluorometer

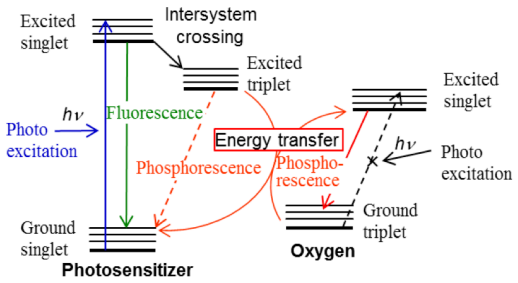

Figure 1. Mechanism for the generation of singlet oxygen.

Singlet oxygen is highly active and destroys biological molecules. Recently, its use for destroying cancer cells or bacteria has been researched. Herein, we describe measurements of phosphorescence at 1270 nm emitted by singlet oxygen using a JASCO near-infrared (NIR) FP-8700 spectrofluorometer with Eosin Y as a photosensitizer.

Keywords

FP-8700, Singlet oxygen, Phosphorescence, Photosensitizer

JASCO INC.
28600 Mary's Court, Easton, MD 21601 USA
Tel: (800) 333-5272, Fax: (410) 822-7526
Application Library: jascoinc.com/applications

Experimental

Measurement Conditions			
Emission Wavelength	1200 - 1350 nm	Excitation Wavelength	300 - 700 nm
Excitation Step	5 nm	Data Interval	2 nm

Results

The excitation emission matrix (EEM) of EosinY ethanol solution is shown in Figure 2. The phosphorescence of singlet oxygen around 1270 nm was detected when the excitation wavelength range is 470-560 nm. The EEM measurement of singlet oxygen reveals a suitable excitation wavelength as well as whether the singlet oxygen has been generated.

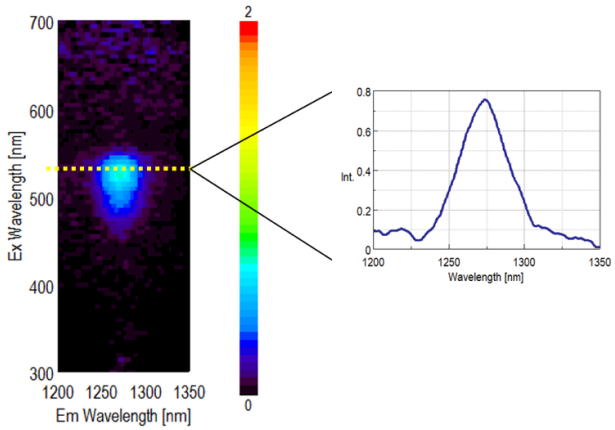

Figure 2. EEM and emission spectra (λEx: 525 nm) of singlet oxygen.

JASCO INC.
28600 Mary's Court, Easton, MD 21601 USA
Tel: (800) 333-5272, Fax: (410) 822-7526
Application Library: jascoinc.com/applications