3D Fluorescence Spectra（Fluorescence Fingerprint）Measurement of Eggs

INTRODUCTION

Hitachi's F-7000 fluorescence spectrometer, with the highest throughput level of 3D fluorescence spectrum (fluorescence fingerprint) analysis for the instrument class, is used in a broad range of fields from the cutting-edge research to the application for quality control. This time, the fluorescence fingerprint of an egg was obtained to understand its fluorescence properties. The time required for the analysis of the wavelength range used this time was about 2 minutes. When analyzing a liquid samples which do not transmit light such as eggs, the fluorescence from the sample surface is measured by using a solid sample holder. By measuring at the surface, the fluorescence properties of an egg can be measured from the original solution without any preparation such as dilution.
As a result of the fluorescence analysis, three characteristic fluorescence peaks of (i) to (iii) were confirmed from the egg white. These fluorescence fingerprints resulted from the fluorescence peaks originating from protein-constituting amino acids. From the egg yolk, peaks (iv) and (v) were confirmed in addition to the peaks (i) to (iii) while peak (vi) was also confirmed from the egg shell.

SAMPLE

Sample: Liquid egg (egg white, egg yolk, whole egg)
(Each of them was stirred and then, dispensed into a S20 standard cell with round corner bottom. The samples were analyzed after being let stand until bubbles disappear).

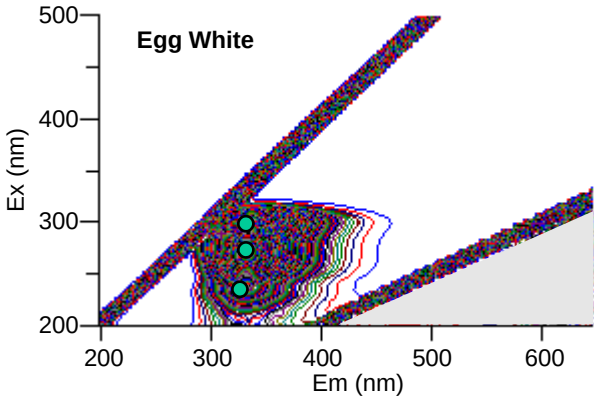
ACCESSORY

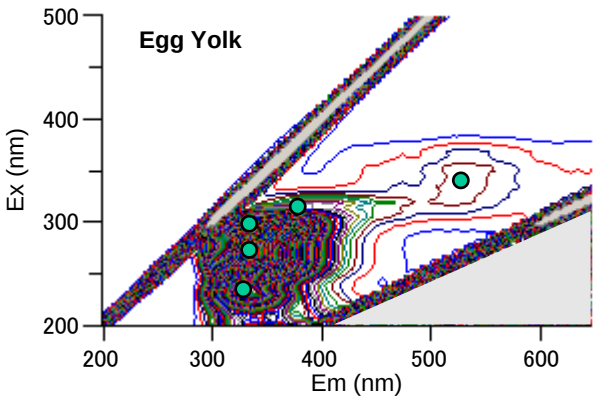
Solid sample holder
（P/N：650-0161）

S20 Standard cell with round corner bottom, GL Sciences Inc.
(P/N：6210-21206 optical path length of 10 mm）

ANALYTICAL CONDITIONS

Instrument	: F-7000	Slit on excitation side	: 5 nm	Photomultiplier Vol.	: 400 V
Excitation wavelength range	: 200-500 nm	Slit on fluorescence side	: 5 nm	Full scale	: 3000
Fluorescence wavelength range	: 200-650 nm	Response	: Automatic	Contour line interval	: 10
Scan speed	: 60000 nm	Detector	: R928F		





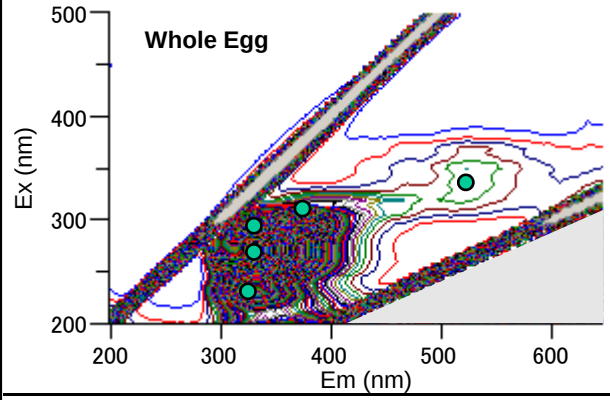


Table 1 Relationship Between Fluorescence Wavelength and Fluorescence Intensity (Liquid Egg)

(i) EX：230.0 nm EM：330.0 nm	1315	4838	597.5
(ii) EX：270.0 nm EM：335.0 nm	1898	1543	1843
(iii) EX：295.0 nm EM：335.0 nm	373.4	1864	2403
(iv) EX：320.0 nm EM：390.0 nm	11.4	90.62	99.6
(v) EX：340.0 nm EM：540.0 nm	2.754	18.07	21.69
(vi) EX：340.0 nm EM：420.0 nm	1.289	43.1	53.37

KEY WORDS
Bio/Medical Science/Food/Pharmaceutical, Food, Egg, Egg Yolk, Egg White, Whole Egg, Shell, Fluorescence Fingerprint, Distinction Analysis, 3D Fluorescence Spectrum, FL, F-7000

Fluorophotometer (FL)

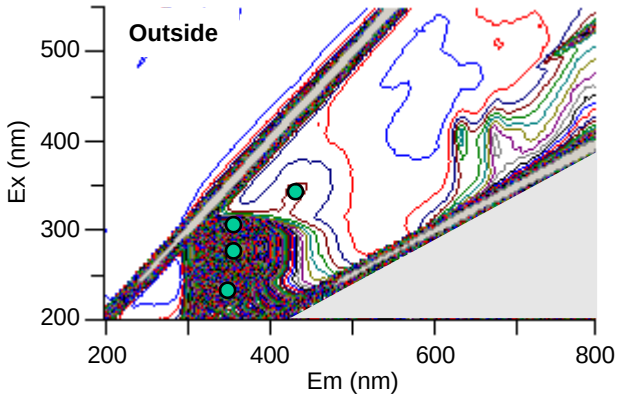
Sheet No. FL130006-01

3D Fluorescence Spectra (Fluorescence Fingerprint) Measurement of Eggs

SAMPLE	ACCESSORY
Sample: Egg shell (outside, inside) (For the sample setup, the egg shell was placed between two round quartz glass plates)	Solid sample holder (P/N：650-0161)  Round quartz glass plate, GL Sciences Inc. (P/N：6220-72031 Ø30, t = 1 mm)

ANALYTICAL CONDITIONS

Instrument	: F-7000	Slit on excitation side	: 5 nm	Photomultiplier Vol.	: 400 V
Excitation wavelength range	: 200-550 nm	Slit on fluorescence side	: 5 nm	Full scale	: 5000 (outside) 3000 (inside)
Fluorescence wavelength range	: 200-800 nm	Response	: Automatic		
Scan speed	: 60000 nm	Detector	: R928F	Contour line interval	: 20 (outside) 10（inside）



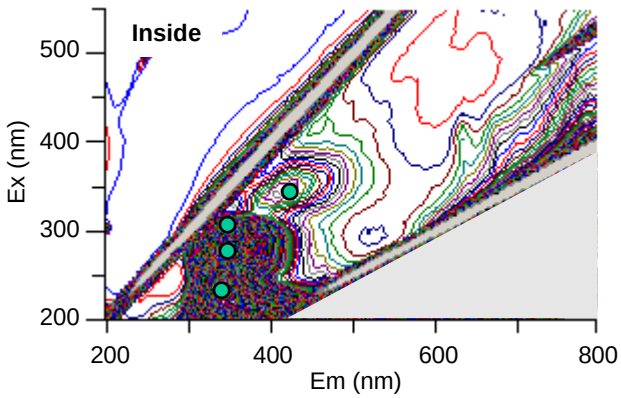


Table 2 Relationship Between Fluorescence Wavelength and Fluorescence Intensity (Shell)

	Shell (inside)	Shell (outside)
(i) EX：230.0 nm EM：330.0 nm	1787	4338
(ii) EX：270.0 nm EM：335.0 nm	1722	3928
(iii) EX：295.0 nm EM：335.0 nm	859.2	1963
(iv) EX：320.0 nm EM：390.0 nm	158.8	87.64
(v) EX：340.0 nm EM：540.0 nm	184.7	80.43
(vi) EX：340.0 nm EM：420.0 nm	40.26	31.27

By using the fluorescence intensities of each sample at six wavelengths, multivariate statistics were performed to analyze the main component. It is shown that the egg yolk and whole egg have similar behaviors while for the egg shell, the behaviors for the outside and inside are different.

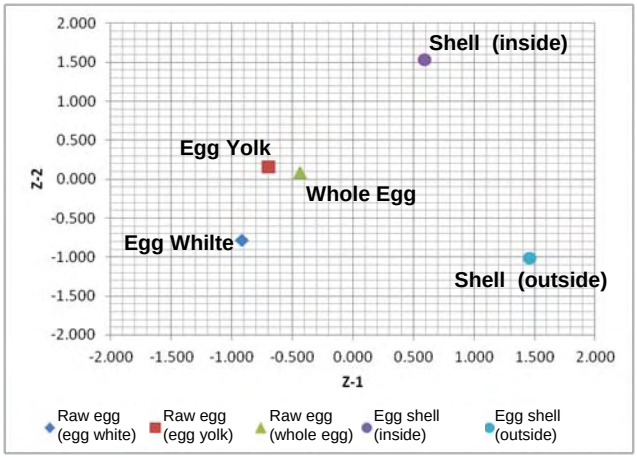


Figure 1 Result of Main Component Analysis

KEY WORDS
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Fluorophotometer (FL)

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