

3D Fluorescence Spectra (Fluorescence Fingerprint) Measurement of Milk Powder

INTRODUCTION

In 2008, there was a problem of melamine being mixed with milk powder to falsely claim the protein content. In order to confirm the melamine content in milk powder, instruments such as HPLC, CMC, and LCMS are used. However, the preparation is cumbersome and it takes a long time to analyze.

This time, the 3D fluorescence spectra (fluorescence fingerprints) of milk powder, melamine, and the mixture were obtained from their powder forms without any preparation.

As a result of the analysis, four characteristic fluorescence peaks of (i) to (iv) were confirmed from the milk powder while fluorescence peaks of (v) and (vi) were confirmed from the melamine powder. Three types of milk powder were mixed with melamine powder at the ratio of 10:1 and by using the six wavelengths, multivariate statistics were performed to analyze the main component. The result of the main component analysis indicated that the main component score shifts to the direction for melamine when milk powder is mixed with melamine powder.

SAMPLE

Sample : Milk powder
Melamine powder (Wako Pure Chemical Industries, Ltd.)

ACCESSORY

Solid sample holder
(P/N : 650-0161)



ANALYTICAL CONDITIONS

Instrument:	F-7000	Slit on excitation side:	5 nm	Photomultiplier Vol.:	400 V
Excitation wavelength range:	220 - 600 nm	Slit on fluorescence side:	5 nm	Full scale:	10000
Fluorescence wavelength range:	220 - 700 nm	Response:	Automatic	Contour line interval:	50
Scan speed:	60000 nm	Detector:	R928F		

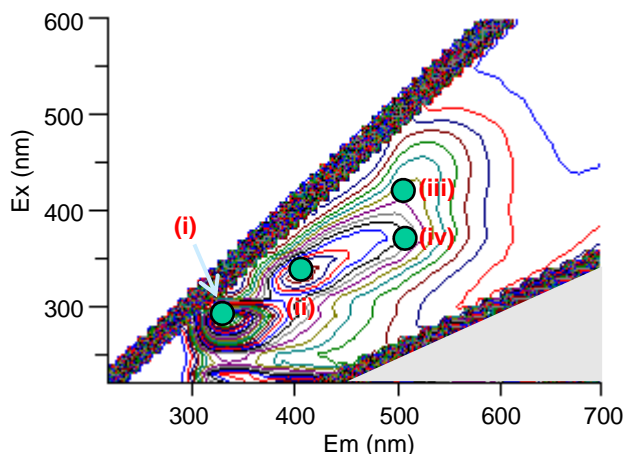


Figure 1 3D Spectrum of Milk Powder

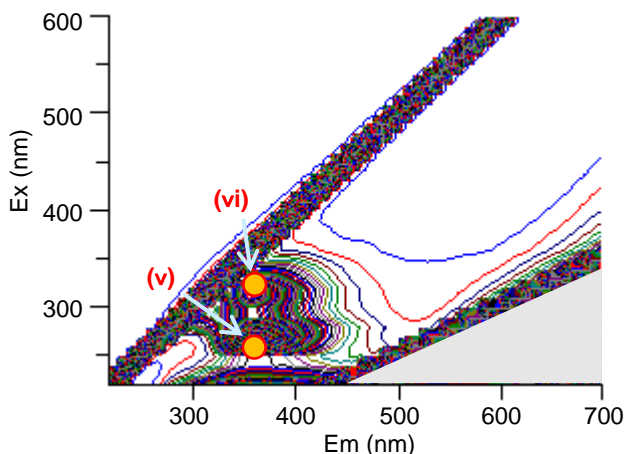


Figure 2 3D Spectrum of Melamine Powder

KEY WORDS

Bio/Medical Science/Food/Pharmaceutical, Food, Milk Powder, Melamine, Food, Fluorescence Fingerprint, Distinction Analysis, 3D Fluorescence Spectrum, FL, F-7000

Fluorophotometer (FL)

Sheet No. FL130007-01

3D Fluorescence Spectra (Fluorescence Fingerprint) Measurement of Milk Powder

SAMPLE	ACCESSORY
Sample: Milk powder Melamine powder (Wako Pure Chemical Industries, Ltd.)	Solid sample holder (P/N : 650-0161) 

ANALYTICAL CONDITIONS

Instrument:	F-7000	Slit on excitation side:	5 nm	Photomultiplier Vol. : 400 V
Excitation wavelength range:	220 - 600 nm	Slit on fluorescence side:	5 nm	Full scale: 10000
Fluorescence wavelength range:	220 - 700 nm	Response:	Automatic	Contour line interval: 50
Scan speed:	60000 nm	Detector:	R928F	

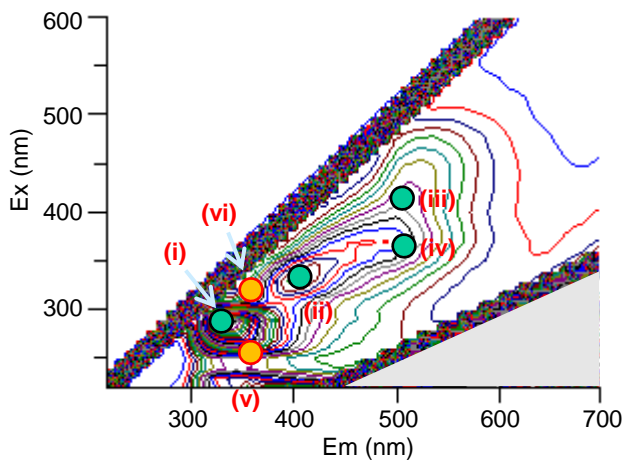


Figure 3 3D Spectrum of Milk Powder
(Mixed with Melamine)

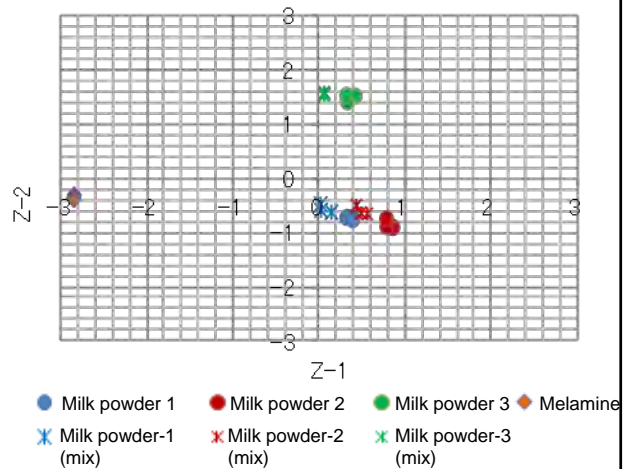


Figure 4 Result of Main Component Analysis
(Plot for N = 3)

Table 1 Relationship Between Fluorescence Wavelength and Fluorescence Intensity (Ex / EM (nm))

	Milk powder 1	Milk powder 2	Milk powder 3	Melamine	Milk powder-1 (mix)	Milk powder-2 (mix)	Milk powder-3 (mix)
(i) 290.0 / 330.0	5432	6931	8570	3143	5309	6824	8139
(ii) 330.0 / 410.0	1743	2160	1734	1313	1713	2106	1696
(iii) 420.0 / 520.0	544.7	667.5	517.1	30.29	502.4	575.4	453.0
(iv) 350.0 / 515.0	571.9	604.5	518.6	46.99	538.5	563.9	426.2
(v) 265.0 / 360.0	2209	2939	3206	9505	3166	3690	4021
(vi) 320.0 / 360.0	863	1303	1104	6906	978.4	1363	1228

KEY WORDS

Bio/Medical Science/Food/Pharmaceutical, Food,
Milk Powder, Melamine, Food, Fluorescence Fingerprint, Distinction Analysis,
3D Fluorescence Spectrum, FL, F-7000

Fluorophotometer (FL)

Sheet No. FL130007-02