# Technical Report

**FL No. 190003** Fluorescence Spectrophotometer

HITACHI
Inspire the Next

# Fluorescence fingerprint measurement of alcoholic beverages using the F-7100 Fluorescence Spectrophotometer

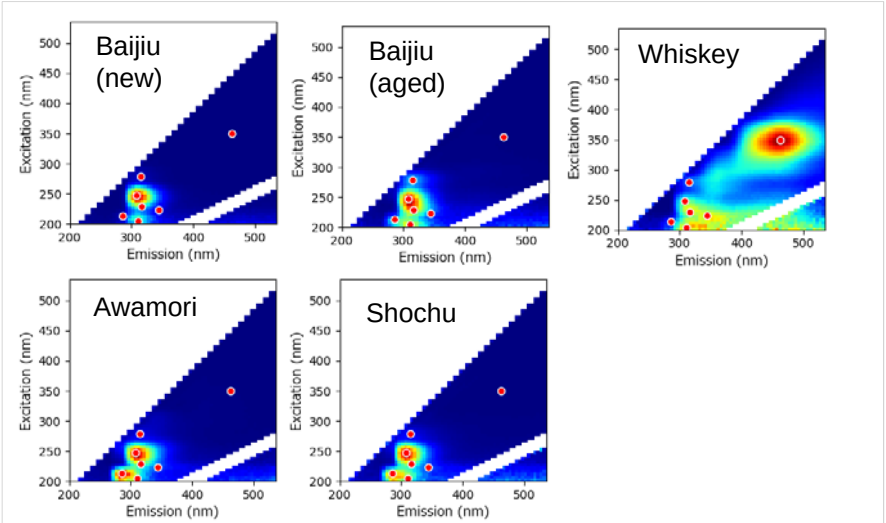
Baijiu is a Chinese distilled spirit with a high alcohol content of 50 to 65%. The T/CBJ2101-2019 Standard for Aged Baijiu was established in China, and 3-D fluorescence spectral measurement results have been reported. Here, we present examples of measurement of the 3-D fluorescence spectrum (fluorescence fingerprint) of alcoholic beverages including baijiu.

1) T/CBJ2101-2019 Standard for Aged Baijiu

F-7100 Fluorescence Spectrophotometer

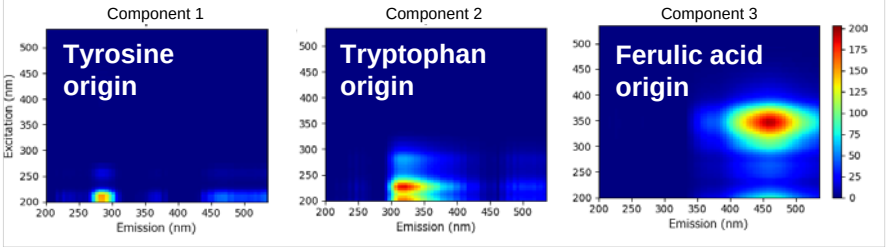
## Fluorescence fingerprint measurement and multivariate analysis of alcoholic beverages

### ■ Measurement data




### ■ PARAFAC analysis

3D peak separation (PARAFAC)



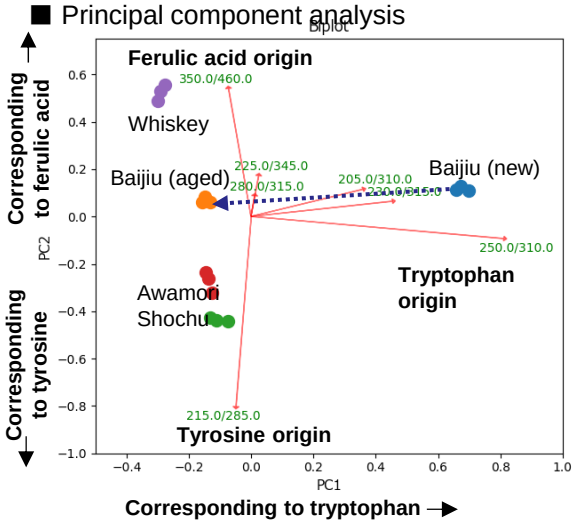

### ■ Measurement conditions and analysis software

Excitation side slit: 5 nm
Fluorescence side slit: 5 nm
Scan speed: 60,000 nm/min
Response: Automatic
Photomultiplier voltage: 400 V
Spectrum correction: ON

Analysis software:
3D SpectAlyze (Dynacom Co., Ltd.)

- ✓ The fluorescence fingerprint of alcoholic beverages was measured.
- ✓ The red plots indicate the characteristic wavelengths for each alcoholic beverage. For ease of differentiation, these are placed in the same locations in each plot.
- ✓ The fluorescence fingerprints obtained were separated into three components by PARAFAC analysis.
- ✓ Based on previously reported examples of the excitation and fluorescence wavelengths for each of the components, component 1 was inferred to originate from tyrosine, component 2 from tryptophan, and component 3 from ferulic acid.

### ■ Principal component analysis




- ✓ The results of a principal component analysis using the characteristic wavelengths for each of the alcoholic beverages are presented as a biplot. It can be seen that the related fluorescent component-containing fractions contained in each alcoholic beverage are separated.
- ✓ Comparing baijiu (aged) to baijiu (new), the plotted values extend along the decreasing direction for the wavelength corresponding to tryptophan (PC1+). Although slight, the plotted values extend along the decreasing direction for the wavelength corresponding to tyrosine (PC2-).
- ✓ It can be seen that the awamori and shochu contained a comparatively large amount of tyrosine, and the whiskey contained a comparatively large amount of ferulic acid.
- ✓ Measurement of 3-D fluorescence spectra is expected to be useful for determining the differences between samples of alcoholic beverages containing baijiu.

Note: The external appearance and specifications of the products mentioned in this technical report are subject to change for improvements.
The data appearing in this document represent an application example and are not a guarantee of performance.

**[KEY WORDS]**
fluorescence spectrophotometer, F-7100, F-7000, EEM, multivariate analysis, fluorescence fingerprint, baijiu, alcohol, beverage, aging, fermentation, aged sake, awamori (millet brandy), shochu

**Hitachi High-Tech Science Corporation**
http://www.hitachi-hightech.com/hhs/