

Application News

Spectrophotometric Analysis

No. A407

Flame Photometric Analysis with Wavelength Shift Using AA-7000

The AA-7000 atomic absorption spectrophotometer can also be used as a flame photometer. In this application, the hollow cathode lamp required for atomic absorption analysis is unnecessary because atomic emission (flame emission) is measured. Excellent sensitivity can be obtained in measurement of such alkaline elements and alkaline-earth elements as Na, K, Ca and Sr as target elements because their analysis wavelengths are in the long wavelength region where there is little influence from flame emission. However, when measuring samples which contain many coexisting substances along with these elements, background emission due to these coexisting substances might be

generated, requiring correction for these influences. The AA-7000 is equipped with a wavelength shift function which allows setting of 2 analysis wavelengths. Thus, background correction can also be conducted using flame photometric analysis by first conducting measurement at the normal analysis wavelength of the total atomic emission and background emission, and then shifting the analysis wavelength by a few nm to conduct measurement of only the background emission. Here we introduce the measurement of potassium in sodium chloride, using the wavelength shift function to correct for the background influence.

Analytical Instrument and Conditions

Table 1 Analytical Conditions

Instrument	AA-7000
Analysis wavelength	766.5 nm
Shift wavelength	760.0 nm
Slit width	0.7 nm
Lamp mode	EMISSION
Flame	Air, acetylene
Burner height	7 mm
Burner angle	None (0°)

One gram of reagent grade sodium chloride was dissolved in purified water and brought to a volume of 100 mL (non-spiked). Potassium standard solution was added and dissolved in sodium solutions to prepare 100 mL standard solutions at 0.2 and 0.4 ppm, respectively, and measurement was conducted by the standard addition method.

The wavelength shift function was used to correct for the background emission originating in sodium chloride. The emission intensity of the above-mentioned non-spiked NaCl 1% solution was measured at 760 nm in the nebulized state as a blank sample, and this value was subtracted from the

value obtained in the subsequent measurement of emission intensity at 766.5 nm to perform background correction.

Fig. 1 shows the wavelength shift setting window. When an element is selected in this window, the shift wavelength is set as the measurement wavelength. That condition is shown in Fig. 2. When [Set back to Original WL] is selected, the measurement wavelength is set as the detection wavelength, returning the window to the state shown in Fig. 1.

The value of the shift wavelength can be changed in 1 nm increments by selecting [Edit Background WL], as shown in Fig. 3.

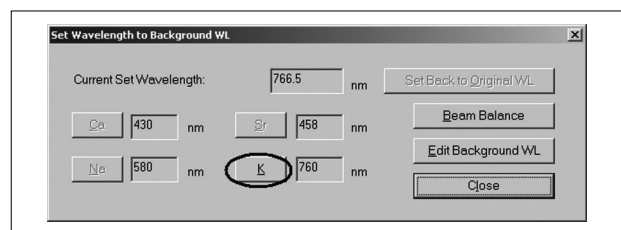


Fig.1 Wavelength Shift Setting Window (No. 1)

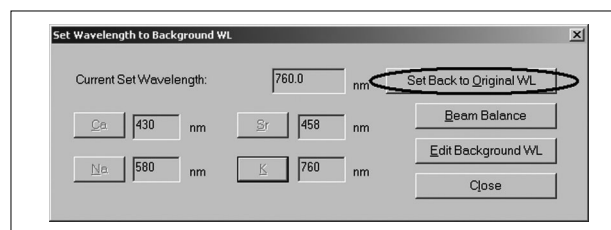


Fig.2 Wavelength Shift Setting Window (No. 2)

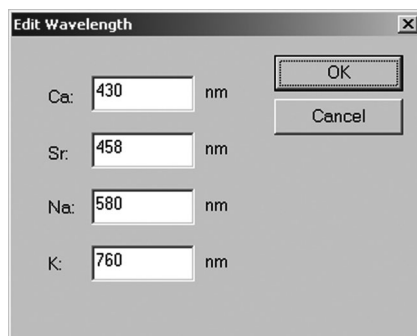


Fig.3 Wavelength Shift Value Setting Window

■ Measurement Results

Table 2 shows the measurement results. The blank shown in the first row was measured using a shift wavelength of 760 nm, and this value was subtracted

as background intensity from the subsequent measurements. Fig. 4 shows the calibration curve generated using the standard addition method.

Table 2 Measurement Results

Action	Sample ID	Set Conc. (mg/L)	Concentration (mg/L)	Energy	Measured Conc. (ppm)	
BLK (blank)	NaCl 1 %			0.0026		Meas. Wavelength 760 nm
MSA (Std Add.)	NaCl 1 %	0		0.0749		
MSA (Std Add.)	NaCl 1 % + 0.2 ppm	0.2		0.3121		Meas. Wavelength 766.5 nm
MSA (Std Add.)	NaCl 1 % + 0.4 ppm	0.4		0.5208		
MSA-RES (Result)	NaCl		0.072		7.2	

Concentration in solution
Concentration in solid

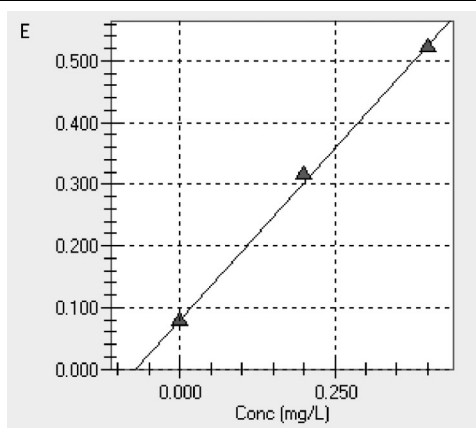


Fig.4 Calibration Curve of K (potassium) in Sodium Chloride by Standard Addition Method

Reference Materials

Japanese Industrial Standards, JIS K 8001 General Rule for Test Methods of Reagents (1998)

Japanese Industrial Standards, JIS K 8150 Sodium Chloride (2006)

NOTES:

*This Application News has been produced and edited using information that was available when the data was acquired for each article. This Application News is subject to revision without prior notice.



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