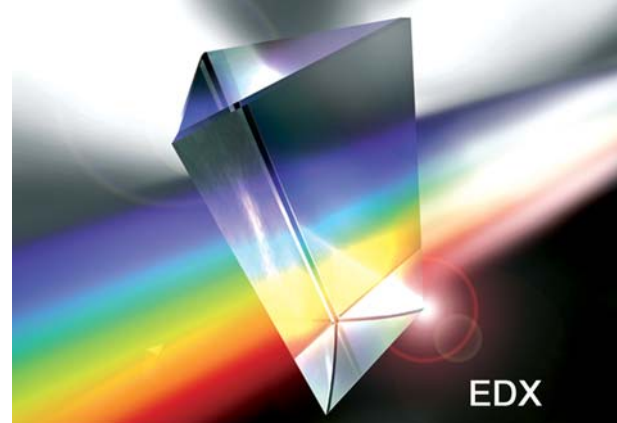


Application Note



Analysis of Trace Elements in Water using Ultra Thin Film (2)

This Application Data introduces an example of comparison between qualitative/quantitative analysis using the FP method, and qualitative analysis using the calibration curve method. The NRC (National Research Council Canada) river water standard sample was analyzed after the same pretreatment that was introduced in Application Data No.16.

In the spotting filter paper method and the thin film method in the EDX-700/800 standard software, the quantitative values are shown in the concentration in water solution, and the amount of deposition on the thin film, respectively.

Sample, Elements

(1) Quantitative sample
NRC SLRS-4 River Water Reference Material for Trace Metals

Table 1 shows the standard values.

(2) Standard samples for calibration curve method

Na: 0.5 to 5 ppm

K: 0.5 to 20 ppm

Fe: 100 to 500 ppb

A standard liquid for atomic absorption was used with dilution.

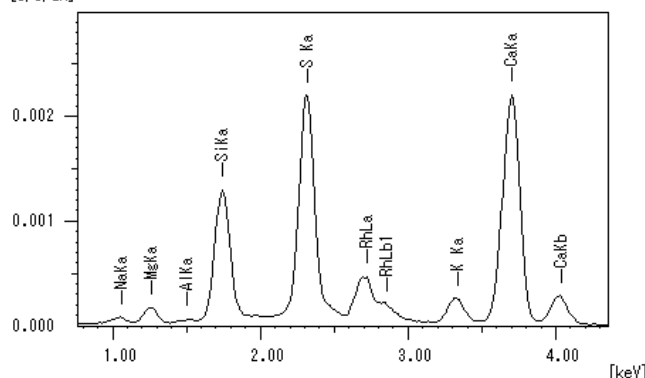
Sample Preparation

Fifty μ L sample was dropped and dried for 40 minutes at 70°C.

Qualitative and Quantitative Analysis

Fig. 1 shows qualitative analysis results for SLRS-4 and Table 1 shows the quantitative values

[cps/uA] Na-Sc



[cps/uA] Ti-U

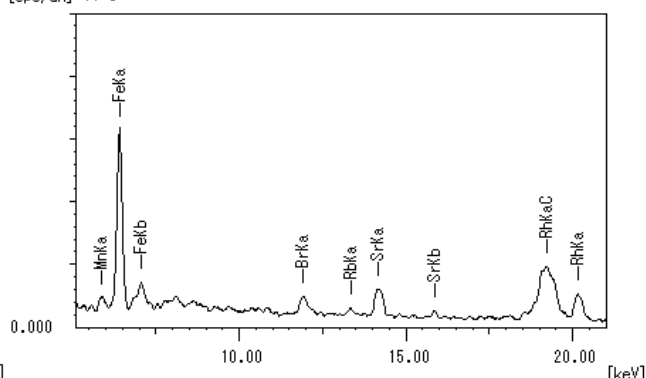


Fig.1 Qualitative Result of SLRS-4

obtained by the FP method, in comparison to the reference values.

Table 1 Certified Mass Concentrations for SLRS-4 μ g/L(ppb) and Quantitative Value

Element	Certified Value	Qualitative Value
Na	2.4*	2.6*
Mg	1.6*	1.4*
Si	-	1.3*
S	-	697
K	0.68*	0.61*
Ca	6.2*	5.6*
Mn	3.37	7.1
Fe	103	98
Br	-	11
Rb	-	7.1
Sr	26.3	39

NIST 1643d Trace Elements in Water was used as the reference for the FP method.

Quantitative Analysis by Empirical Correction Method

Fig. 2 shows the calibration curves for Na, K and Fe. These were used for SLRS-4 quantitative analysis and repeatability tests (n = 10). Table 2 shows the results.

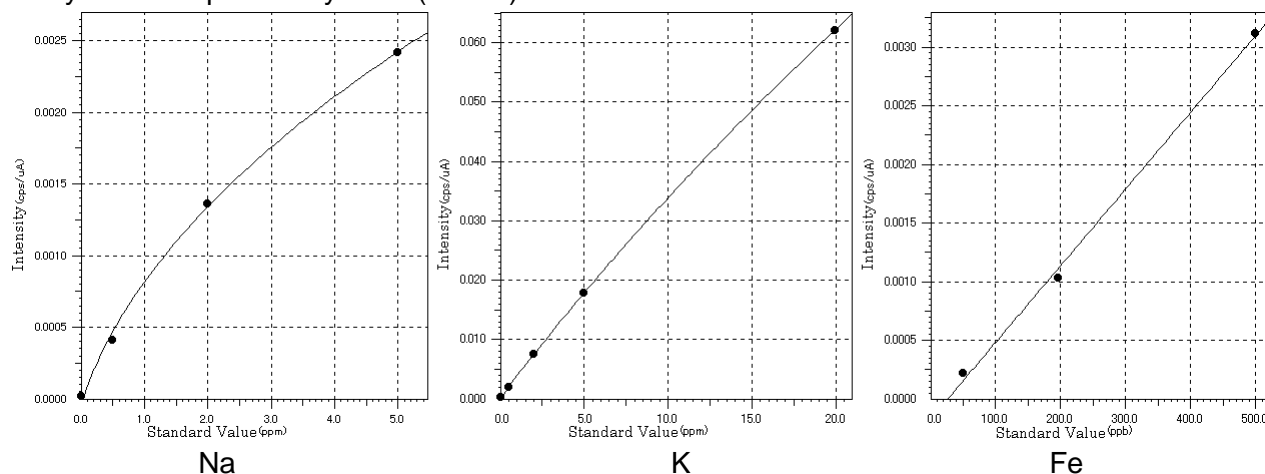


Table 2 Quantitative Value and Repeatability (n=10)

Elements	Na	K	Fe
Average	0.339 ppm	0.558 ppm	159 ppb
Standard Deviation	0.083 ppm	0.027 ppm	13.7 ppb
Coefficient of Variation	24 %	4.8 %	8.6 %
Accuracy of Calibration Curve	0.068 ppm	0.008 ppm	12.1 ppb

Conclusion

Quantitative results showed that the FP method provided values closer to the reference values than the calibration curve method. This is considered to be due to the difference in matrix effects (absorption and excitation effects due to coexisting elements) between the reference and the measured sample. Therefore, the calibration curve method is effective for measurements of samples of the same type, while the FP method is effective for measurements of different types of samples.

Analytical Conditions

Instrument:	EDX-700
X-ray Tube:	Rh target
Filter:	without Ti
Voltage - Current:	50kV-(Auto) 15kV-(Auto)
Atmosphere:	Vacuum
Measurement Diameter:	3 mm
Measurement Time:	1000 sec
Dead Time:	0-12 %

References

EDX-700/800 Application Data No. 11, 12 and 16

The given specifications serve purely as technical information for the user. No guarantee is given on technical specification of the described product and/or procedures.