Application Brief

Food

Agilent

Trusted Answers

Multi-Element Analysis of Foods using Fast Sequential-Flame AAS

Streamline your workflow with an Agilent 280FS FAAS and SIPS sampling system

Measure nine or more elements in 100 food samples every day by automating your AAS analysis

With an ever-increasing trade of foods across borders, greater control methods are needed to ensure the quality and safety of food products. Atomic absorption spectrometry (AAS) techniques are widely used for the analysis of foods. Flame AAS (FAAS) can easily quantify nutritional elements in a variety of samples—an important application for product labeling and quality control of foods.

While AA is a well-established technique, there are ways to improve the analytical workflow, enabling labs to accurately analyze as many as 100 food samples per day. Automating sample preparation, instrument calibration, and lamp selection using a fast sequential FAAS and sampling pumps, avoids potential sources of error, improves sample throughput, and reduces costs.

Analyze your foods with ease, speed, and confidence

The Agilent 280FS AAS, which combines eight lamps (including multi-element lamps) with the Agilent Fast Sequential (FS) mode, was fitted with an Agilent Sample Introduction Pump System (SIPS 20). When operating in FS mode, the 280 FS allows for fast multi-element analysis of samples, measuring more than nine elements from a single aspiration. The 280FS AAS is fully controlled using Agilent SpectrAA software, which uses automated features to simplify method development and sample analysis, improving data quality.

In this study, K, Na, Ca, Cu, Mg, Mn, Fe, Ni, and Zn were measured in a High Purity Standards (HPS) Orchard Leaves certified reference material (OL CRM) by FAAS.

Achieve high precision with PROMT

The 280FS improves analysis times without compromising on precision using the PROMT function of the SpectrAA software. The analyst sets the %RSD needed, and the software automatically optimizes read times—with high concentration elements requiring less read time than low concentration elements to achieve the same precision.

Reduce sample reruns by automating sample preparation

To analyze nine elements in 100 food samples a day by FAAS, analysts would need to prepare nine sets of calibration standards, dilute samples and/or add ionization buffer to all 100 samples. Each step is a potential source of contamination and error, as well as requiring a lot of analyst-time. Incorrectly prepared standards, sample preparation errors including dilution and incorrect addition of ionization buffer can all force sample remeasurements, which waste valuable resources, adding to the cost-of-analysis.

The SIPS 20 accessory for the 280FS AAS takes much of the manual work out of analyzing samples by providing in-line calibration and sample dilution. It can also automatically add an ionization buffer or a releasing agent for elements that require greater chemistry-control, further simplifying sample preparation and reducing reagent consumption.

Increase the productivity of FAAS with SIPS

When using the SIPS 20 accessory, a single bulk standard solution is prepared at the concentration of the highest calibration standard. The SpectrAA software then controls in-line dilutions of the standard at different dilution factors to construct a calibration curve for each element. Any result that is over range is automatically diluted and remeasured to bring the result within the respective calibration range, eliminating a time-consuming task for the analyst.

Analysts save time using FS-FAAS with PROMT and SIPS compared to other FAAS methods (Figure 1). Table 1 shows good agreement between the measured and certified values of the OL CRM, within ±10%, demonstrating the accuracy of the method. The stability was tested by measuring digested food samples, with a QC solution measured after every five samples. Excellent precision and stability were achieved, as shown by the low standard deviation and %RSD of the results for all nine elements (Table 2).

Figure 1. Analysis time of FAAS methods for nine elements in the OL CRM.

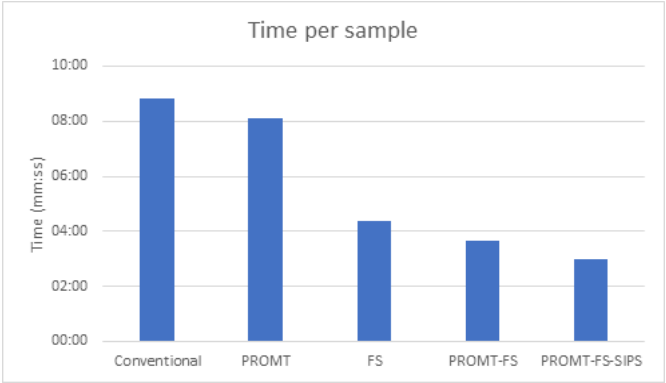

Table 1. Recoveries of elements measured in the OL CRM by FS-FAAS.

Element	MDL (mg/L)	Measured Concentration (mg/L)	Certified Concentration (mg/L)	Recovery (%)
K	1.45	157	150	105
Na	0.00945	0.99	1.00	99
Ca	0.165	197	200	99
Cu	0.0537	0.11	0.10	110
Mg	0.00308	59.2	60.0	99
Mn	0.0421	1.02	1.00	102
Fe	0.149	3.03	3.00	101
*Ni	0.0726	0.325	0.300 (spike level)	108
Zn	0.0136	25.7	25.0	103

*Spike recovery result, as certified conc for Ni of 0.009 mg/L was <MDL.

Table 2. Stability of measurements from 67 solutions over 4 hours 19 minutes, with no recalibration, n=12.

Element	Mean Conc (mg/L)	Expected Conc (mg/L)	Recovery (%)	SD (mg/L)	%RSD
K	96.7	100	97	1.25	1.3
Na	30.6	30.0	102	1.39	4.5
Ca	32.1	30.0	107	1.46	4.6
Cu	3.67	3.75	98	0.049	1.3
Mg	51.5	50.0	103	1.41	2.7
Mn	2.48	2.50	99	0.056	2.3
Fe	10.2	10.0	102	0.29	2.8
Ni	6.26	6.25	100	0.12	1.9
Zn	1.24	1.25	99	0.017	1.4

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