SHIMADZU APPLICATION NEWS

SPECTROPHOTOMETRIC ANALYSIS No. A216

Determination of Metal Elements by Graphite Furnace AAS

— Direct Determination of Iron, Copper and Zinc in Cooking Oil —

Improvements in life style are linked with requirements for higher quality and safety in food. With respect to cooking oils, it has become necessary to control the concentration of metal elements contained in both products and raw materials.

Generally, extremely small amounts of metal elements are contained in foods which makes it difficult to determine them by flame atomic absorption spectrophotometry directly. For this reason, oils first need to be decomposed by either wet or dry methods, then dissolved in acids, which is time-consuming and laborious.

By graphite furnace AAS, however, direct high sensitivity analysis is possible with just diluting samples with solvents. So it is a very effective means for quality control. Introduced here are analyses for iron, copper and zinc by graphite furnace AAS.

■ Sample Preparation and Analytical Conditions

Samples were diluted to be within the range of concentration of calibration curves with methylisobutylketone (MIBK), of which 10 μℓ ~ μℓ was introduced into the graphite tube directly for measurement. In these data, 2g of sample was dissolved in MIBK from which 10 mℓ was prepared and subjected to measurement. The analytical conditions are shown in the table below. In the measurement for Fe, in which there was interference from other elements, the standard addition method was applied, while a calibration curve method was used in the measurements for Cu and Zn as interference was not exhibited. Values automatically calculated from the calibration curves were converted by the final concentration calculation program (built in the AA-680) to the concentrations of the metal elements in the oil.

Table 1 Analytical Conditions

Element	Fe	Cu	Zn
Analytical line (nm)	248. 3	324. 8	213. 9
GFA Conditions			
Step 1	80 °C/20 sec R	80 °C/20 sec R	80 °C/20 sec R
2	750 °C/15 sec R	750 °C/15 sec R	300 °C/15 sec R
3	750 °C/15 sec S	750 °C/15 sec S	300 °C/15 sec S
4	2300 °C/ 4 sec S	2400 °C/ 4 sec S	1300 °C/ 4 sec S
5	2700 °C/ 2 sec S	2700 °C/ 2 sec S	2700 °C/ 2 sec S
Sample volume (μℓ)	10	10	10

■ Determination of Iron

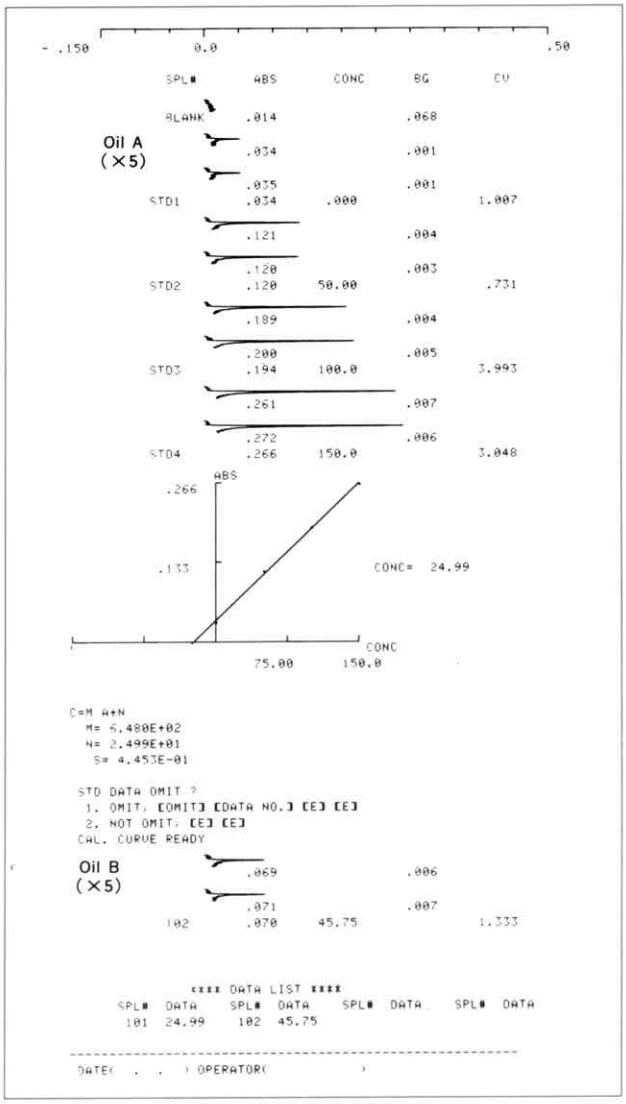

Fig. 1 Measurement for Iron

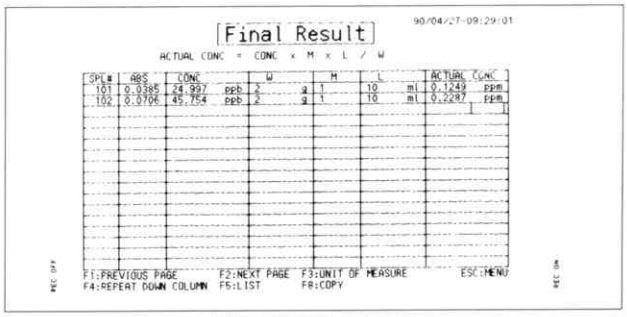

Fig. 2 Final Result for Iron

■ Determination of Copper

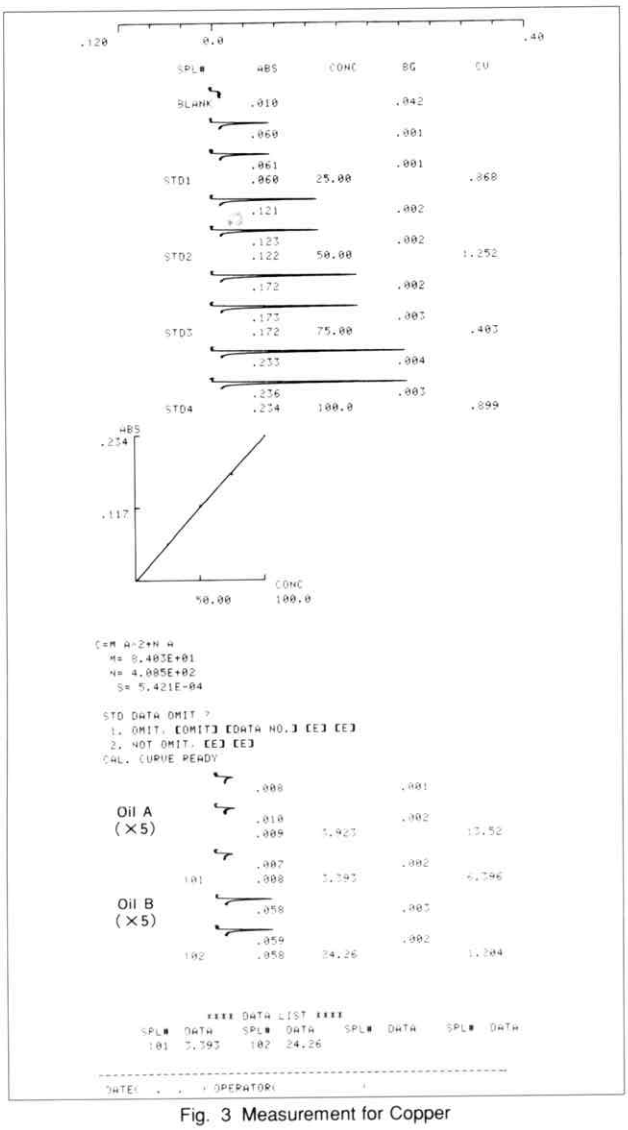

Fig. 3 Measurement for Copper

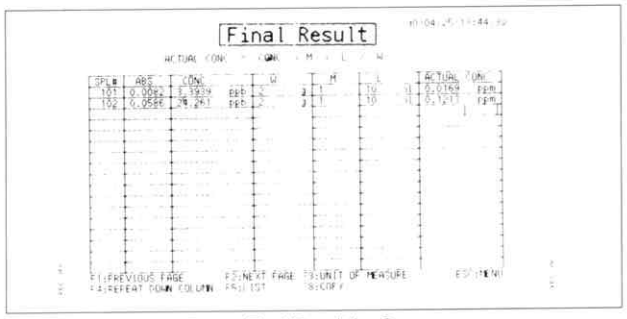

Fig. 4 Final Result for Copper

■ Determination of Zinc

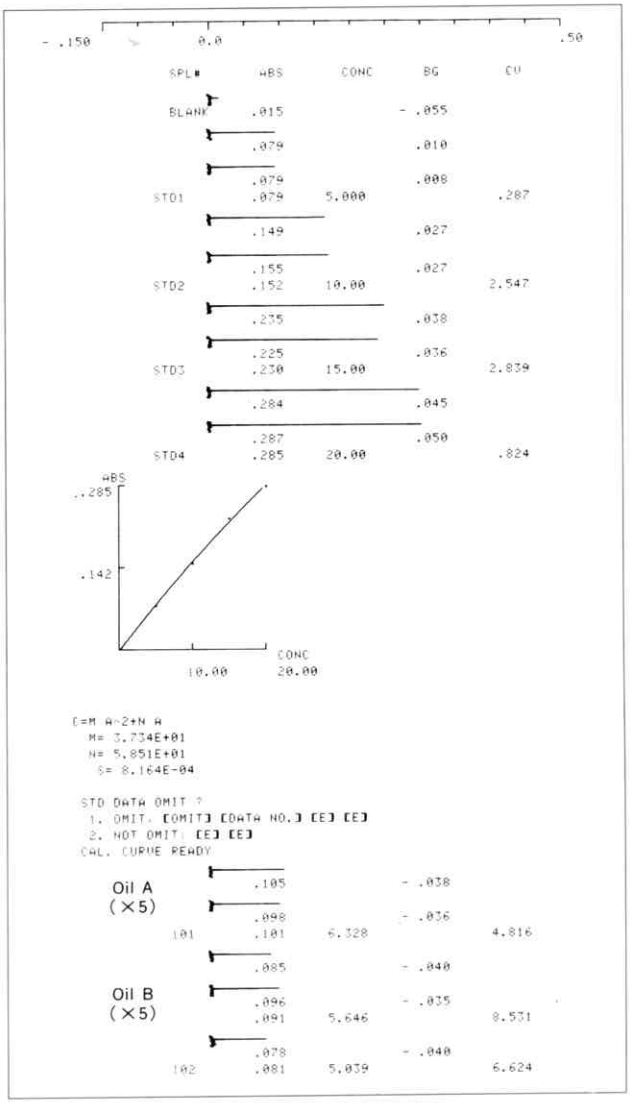

Fig. 5 Measurement for Zinc

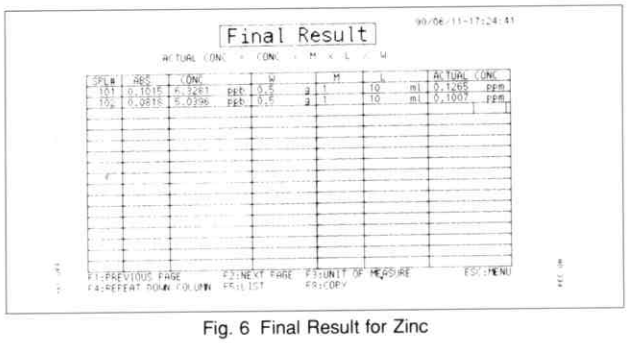

Fig. 6 Final Result for Zinc

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