Application of microwave digestion in the determination of aluminum in vermicelli

1. Introduction

Chinese vermicelli is a common beloved food in China. In order to improve the smooth and elastic flavor, alum is always added as additives, which introduces aluminum into the food. In 1989, the world health organization officially proposed that aluminum is an unnecessary element to human body. The excessive intake and accumulation of aluminum will cause great harm to human health. So the accurate quantitative analysis of aluminum inside Chinese vermicelli is of great importance for food safety. Microwave digestion has the advantages as increasing reaction speed, providing a total airtight reaction environment to prevent sample contamination, ensuring good digestion result etc. It can ensure the precise and accurate digestion of vermicelli.

2. Instrument and reagent

Instrument:

The digestions were carried out with M6 microwave digestion system and GT-400 high throughput digestion vessels. The determination of the trace element was conducted by ICP-MS.

M6 microwave digestion system

GT-400 rotors

G-400 hot block 试剂：

Reagent:

HNO_3 (GR)

Sample: Chinese vermicelli quality control sample

3. Method

1. Weigh 0.3 g Chinese vermicelli samples in to sample cup.
2. Add HNO_3 into the sample cup swirl the cup to mix the sample and acid thoroughly.
3. Add the same amount of HNO_3 into the sample cup as sample blank, then seal the vessel.
4. Set the microwave digestion program as shown in the following table:

Table1：Microwave digestion program

Step	Setting temperature(℃)	Ramp time (min)	Temperature holding (min)
1	140	10	5
2	190	8	15

5. Take the vessels out of the cavity when the temperature falls under 60 ℃.
6. Open the vessels and place them on the hot block to evaporate acid at 180℃. Dilute the sample to 50 mL with deionized water when the temperature of the sample cools to room temperature.
7. The final solutions were tested via ICP-MS according to the standard GB 5009.268.

4. Results and discussion

Table2：ICP-MS measurement for Al inside quality control sample

Quality control sample n=4

	Found value（mg/L)	Certified value（mg/L)	Recovery（%)
1	28.46	27.1±1.3	105
2	26.15		96
3	27.32		101
4	27.54		102

As shown in the result, the method present good stability and accuracy in the determination of aluminum as additive in Chinese vermicelli.

5. Conclusion

The analysis of aluminum inside Chinese vermicelli shows good correlation between the found and the certified concentrations. It is a proof for M6 microwave digestion system can perform accurate and precise sample preparation step, which provided the basis for interference-free ICP-MS measurement.

Due to the advanced full vessel real-time temperature monitor and pressure control technique, the digestion unit not only ensures the safe and precise sample digestion but also improves the accuracy and efficiency during the experiment.