The application of microwave digestion in the determination of sodium and calcium in milk powder

1. Introduction

Milk powder is a common food supply in daily life. It contains various nutrition as vitamin, carbohydrate, protein, minerals etc. Some minerals additives as sodium and calcium is important quality criterion to evaluate the quality of milk powder. So the fast and accurate analysis of sodium and calcium level inside milk powder is vital. Here we present microwave digestion as fast sample preparation method coupled AAS technique to determine calcium and sodium level inside milk powder. The sample preparation method ensures the analysis's accuracy, efficiency and convenience in determine minerals inside milk powder.

2. Instrument and reagents

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 AAS.

M6 microwave digestion system

GT-400 rotor

G-400 hot block

Reagent:
HNO_3 (GR)
Sample:
Milk powder-sodium quality control sample
Milk powder-calcium quality control sample

3. Method

1. Weigh 0.2 g milk powder quality control samples in to sample cup.
2. Add HNO_3 into the sample cup swirl the cup to mix the sample and acid thoroughly. Then seal the vessels and put them into the microwave cavity.
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:

Table 1: Microwave digestion program

Step	Setting temperature(℃)	Ramp time (min)	Temperature holding (min)
1	140	10	5
2	200	8	30

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 by AAS according to the guideline 《GB 5009.91-2017 national food safety standard》and 《GB 5009.91-2017 national food safety standard the determination of potassium and sodium inside the food》and《GB 5009.92-2016 national food safety standard the determination of calcium inside the food 》

4. Results and discussion

Table2: Sodium and calcium founded value in milk powder quality control sample

n=3

Sodium					Calcium				
No	**Weight (g)**	**Found value (mg/kg)**	**Certified value (mg/kg)**	**R.S.D%**	**No**	**Weight (g)**	**Found value (mg/kg)**	**Certified value (mg/kg)**	**R.S.D%**
1	0.2005	2803	2643± 163	2.36	1	0.2009	8606	8245± 409	1.92
2	0.2027	2713			2	0.2002	8896		
3	0.2009	2678			3	0.2004	8608		

As shown in the result, the method presents good stability and accuracy in the determination of sodium and calcium inside the milk powder.

5. Conclusion

Preekem's M6 microwave digestion system can digestion the milk powder thoroughly to a clear solution. Thanks 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 stability during the experiment. The microwave digestion method can also be applied in the determination of other mineral additives inside milk powder.