

Application of microwave digestion in the determination of elements in Chinese traditional herb medicine

1. Introduction

Chinese traditional herb medicine is one of the treasures in Chinese culture. The herbal therapy is derived from plants, animals and substances occurring in the natural environment. As the core of national pharmaceutical production standard, the latest version of "Chinese Pharmacopoeia" increase the demands in determining heavy metal in the traditional Chinese herb medicine. Common digestion methods can easily cause the loss of volatile elements such as mercury and arsenic. While, microwave digestion is an air-tight digestion instrument that can ensure the efficiency and accuracy of sample preparation for elemental analysis. Here we present a microwave digestion method for citrus leaves (One of Chinese traditional herb medicines). The prepared sample were analysis by ICP-MS and the results shows good accuracy and reproducibility.

2. Instrument and reagent

Instrument:

The digestions were carried out with M3 microwave digestion system and 16 GT400 digestion vessels. The determination of the trace element was conducted by ICP-MS.



M3 microwave digestion system



16GT400 rotor



G-400 hot block

Reagent: HNO_3 (GR)

Sample: citrus leave quality control sample

3. Method

1. Weigh 0.5 g citrus leave quality control samples were into 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 following table:

Step	Setting temperature(°C)	Ramp time (min)	Temperature holding (min)
1	140	8	5
2	190	8	20

5. Take the vessels out of the cavity when the temperature falls under 60 °C.
6. Open the vessels and place them on the hot block to evaporate acid at 100 °C for 15 min. Dilute the sample to 50 mL with deionized water when the temperature of the vessels cools to room temperature.
7. The final solutions were tested by ICP-MS according to the 2020 version of Chinese Pharmacopoeia.

4. Result

n = 6

Element	Certified value (mg/kg)	Found value (mg/kg)	RSD (%)
Cr	1.25±0.11	1.29	2.3
Hg	0.15±0.02	0.17	1.5
Pb	9.7±0.9	9.4	1.6
Cd	0.17±0.02	0.19	2.9
As	1.1±0.2	1.4	3.9

The result shows that the harmful heavy metals inside citrus leaves has a good correlation between the found value and the certified concentration. This is proof for the accurate and precise sample preparation treatment via microwave digestion. The air-tight microwave digestion vessel prevents the loss of volatile elements.

5. Conclusion

Preekem's M3 microwave digestion system coupled with GT-400 rotor can digestion the citrus leaves 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 reproducibility during the experiment.