HP16 high pressure rotor in the application of digesting platinum-rhodium alloy

1. Introduction

Platinum-rhodium alloy (PtRh) has been widely used in the field as catalyst, industry appliance due to its special physical and chemical properties as high melting point, chemical stability and high catalytic activity. Platinum-rhodium alloy has many forms as PtRh3.5、PtRh7、PtRh10、PtRh25 and PtRh40 for different usage. Among them PtRh10 is often called “standard alloy” and is the most widely used. The impurities or metal oxides additives may affect the material’s properties. So the precise determination of element inside platinum-rhodium alloy is of extreme high practical value. M6 microwave digestion system couples with high performance rotor can be applied in digesting “tough” material. The method has the advantages as efficient, low risk of cross contamination, eco-friendly etc.

2. Instrument and reagents

Instrument:

The digestions were carried out with M6 microwave digestion system and HP16 high pressure digestion vessels.

M6 microwave digestion system

HP16 rotor

G-160 hot block

Reagent:

HNO_3 (GR) ; HCl （GR）

Sample: PtRh10 alloy (Pt: Rh = 9;1)

3. Method

1. Weigh 0.1 g alloy into sample cup.
2. Add certain amount of HCl and HNO_3 into the sample cup (Here we use aqua regia as the digestion acid). Then swirl the cup to mix the sample and acid thoroughly.
3. Seal the vessel and place the rotor into the cavity.
4. Set the microwave digestion program as shown in the following table.

Table 1. Microwave digestion method

Step	Setting temperature(℃)	Ramp time (min)	Temperature holding (min)
1	140	10	5
2	180	8	5
3	225	10	60

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. Dilute the sample with deionized water when the temperature of the sample cools to room temperature.

4. Result and discussion

The final digestion solution for Pt-Rh is clear as shown in the figure below.

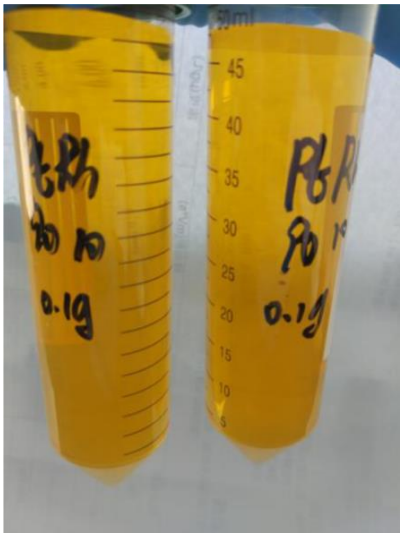

Fig.1 PtRh10 digestion solution

The result shows that, HCl based mixed acid can digest PtRh10 alloy successfully. The concentration of hydrochloric acid has significant effect on the dissolution of PtRh10 alloy. As the concentration of hydrochloric acid increases, the dissolution ability of PtRh alloy increase at the same time due to the increase of [Cl^-] complexation. However, limited by the dipole of hydrochloric acid, certain amount of nitric acid should be added to increase the microwave absorb ability to ensures the temperature rising.

5. Conclusion

Preekem's M6 microwave digestion system coupled with HP 16 rotor can be applied in the digestion of PtRh10 alloy. Thanks to the advanced full vessel IR R-temp and precise pressure control unit, M6 can ensure the safe and precise sample digestion during the experiment.