DIGESTION OF SAMPLES with PGEs WITH ULTRAWAVE

Procedure for complete digestion of **Rh, Ru, Ir sponge** and **pure Rhodium powder**, using Single Reaction Chamber technology

Introduction

Platinum Group Elements (PGEs) are considered as the most valuable precious metals.

For this reason, they are often used for jewelry and ornament purpose, but they also play an important role in the **automotive catalytic converter** production, thanks to their proprieties to convert cars emissions in less toxics compounds.

Samples with PGEs content are chemically inert materials and, for this reason, they are difficult to be prepared for ICP analysis. Hot plate systems are often not the right solution, since they don't provide with enough temperature and pressure capabilities to assure the complete digestion. Moreover, they suffer from airborne contamination, long programs and poor recovery of volatile compounds.

The Closed vessel microwave digestion, has proven to be an effective technique with better, fast digestion, clean environment, and full recovery of volatile compounds but PGEs samples requires high temperature and pressure conditions that, in a conventional microwave unit, lead to frequent consumables replacement.

Milestone's UltraWAVE, thanks to its unique **Single reaction chamber (SRC)** technology, it is the only system able to achieve high temperature and pressure conditions, necessary for a better digestion of PGEs samples, preventing high consumables cost. UltraWAVE stainless steel reactor and its unique technology allows to perform a simultaneous digestion of samples at high temperature for long time.

This application report was developed to digest **pure Rhodium powder** and **Rh, Ru and Ir sponges** samples, frequently used for **automotive catalytic converter** production.
The aim of this application report is to verify the complete dissolution of these samples.

APPLICATION REPORT

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Instrumentations

Milestone's UltraWAVE microwave digestion system features the Single Reaction Chamber (SRC) technology, giving it higher performance and greater productivity than conventional closed-vessel microwave digestion.

Unlike conventional systems which use individual, pressurized vessels for each sample, the UltraWAVE features a large pressurized reaction chamber in which all samples are digested simultaneously in Quartz, Glass or Teflon vials. Since the chamber is pressurized prior the start of the run, cross contamination or loss of volatile elements does not occur.
Disposable glass vials can also be used, and this, in turn, eliminates vessel cleaning.

Analytical Procedure for sponges

For this test, we performed the simultaneous digestion of with Rh, Ru and Ir sponges samples in the 5-position rack, using the 40 mL Quartz vial.

The procedure used is reported here below:

Number of positions	Sample Name	Sample amount	Reagents
5	Rh, Ru, Ir sponges	Up to 100 mg	10 ml HCl 37%

Microwave program:

Step	Time	T1	Power
1	00:25:00	280°C	1500W
2	01:00:00	280°C	1500W

Analytical Procedure for pure Rhodium powder

We used the **40 mL Quartz vials**. The procedure used is reported here below:

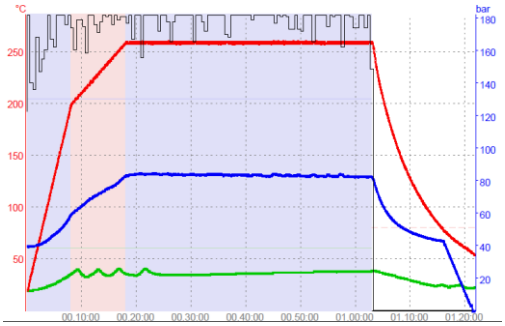
Number of positions	Sample Name	Sample amount	Reagents
5	Rhodium powder	Up to 70 mg	10 ml HCl 37%, 150 µL of Br2

Microwave program:

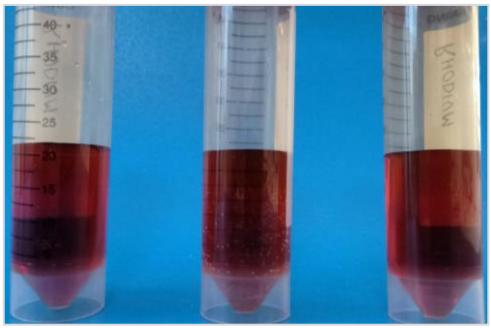
Step	Time	T1	Power
1	00:08:00	200°C	1500W
2	00:10:00	260°C	1500W
3	00:45:00	260°C	1500W

Results for Rh, Ru, Ir sponges and Rhodium powder

Samples were completely dissolved without any residue thus assuring full recovery of the elements of interest.



Rh, Ru, Ir sponges



Pure Rhodium powder

Conclusions

UltraWAVE is the only system able to achieve the **complete digestion** of the most challenging inorganic samples (with PGEs content, for example) such as the **Rh, Ru and Ir sponges** and the **pure Rhodium powder**. UltraWAVE offers unmatchable temperature and pressure capabilities even for long processing time assuring their complete digestion.
It offers lower consumables costs, ease of use and superior digestion quality (high temperature and pressure conditions).
Milestone's **UltraWAVE** is the right solution for preparation of samples with **PGEs content.**