

Application Note - The leachability of quartz digestion vessels

Introduction:

The purpose of this study is to show the leachability of the quartz digestion vessels in a **NOVAWAVE** digestion system. The vessels were manufactured and annealed prior to testing.

Sample Type:

Sample volume: *PlasmaPURE* HNO₃ (70%) 10ml

Supplies and Reagent:

- 1) **NOVAWAVE** Microwave Digestion System, Model SA*
- 2) Quartz 50ml Vessels*
- 3) Teflon® Caps and Safety Pressure Release Caps, pre-set release pressure at 30 bar (435 psi) *
- 4) *PlasmaPURE* HNO₃ (70%) 10ml*
- 5) Analytical Balance 4 Decimal Places, Mettler-Toledo
- 6) Spectroflame Modula FMD-07 ICP-OES, Spectro Analytical
- 7) Mini X-Flow Nebulizer*
- 8) 1.2 Alumina Injector Torch*
- 9) Baffled Cyclonic Spray Chamber*
- 10) 10ml Graduated Cylinder, Corning

Sample Preparation Procedure:

The sample was digested following USEPA 3051 method protocols. The nitric acid was added to 3 quartz vessels using a graduated cylinder. They were placed in the rack and digested following the **NOVAWAVE** heating profile. After cooling to room temperature, one of the quartz vessels was normalized to 50ml with DI water (digestion 1). The two remaining quartz vessels were digested a second time. After cooling to room temperature, the second quartz vessel was normalized to 50ml with DI water (digestion 2). The final quartz vessel was digested a third time. After cooling to room temperature, the final vessel was normalized to 50ml with DI water (digestion 3).

Discussion:

At the end of each digestion (after cooling to room temperature), the vessels should be unlocked slowly in a fume-hood. To assess any element carry-over, a digestion of peach leaves (NIST CRM 1547) was performed using the same heating profile. Afterwards, the vessel was rinsed with DI water and dried with a Kim wipe and a fourth digestion (with 10ml *PlasmaPURE* HNO₃ (70%)) was run (digestion 4).

NOVAWAVE Heating Program:

STAGE	RAMP TIME (Minutes)	PRESSURE (psi-limit)	TEMPERATURE (°C)	HOLD TIME minutes
1	10	435	200	10

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Recoveries:

Level 1

Element Symbol	λ (nm)	IDL (ppb)	Dig. 1 ¹ (ppb)	Dig. 2 ² (ppb)	Dig. 3 ³ (ppb)	% Rec. Peach Leaves	Dig. 4 ⁴ (ppb)	Quartz Purity (ppb)
Al	396.15	4.7	< DL	< DL	< DL	102.9	< DL	15000
Ca	422.67	0.2	< DL	< DL	< DL	103.8	< DL	500
Cr	283.56	5.4	< DL	< DL	< DL	---	<DL	<50
Cu	324.75	1.5	< DL	< DL	< DL	---	< DL	<50
Fe	259.94	0.7	< DL	< DL	< DL	101.0	< DL	100
Li	670.78	1.2	< DL	1.6	<DL	---	< DL	600
Mg	285.21	0.3	< DL	0.3	<DL	96.3	< DL	50
Mn	257.61	0.7	< DL	0.6	<DL	97.2	< DL	50
Ti	334.94	2.5	< DL	< DL	<DL	---	< DL	1100
Zr	339.19	3.1	< DL	< DL	<DL	---	< DL	700

¹ Dig. 1 : 20 min. digestion

² Dig. 2: 40 min. total time digestion

³ Dig. 3: 60 min. total time digestion

⁴ Dig. 4: 20 min. digestion

Conclusions:

There are no significant metal leachables observed with the quartz vessels for the **NOVAWAVE** digestion system when concentrated nitric acid is digested.

References:

EPA 3051 Microwave digestion method

Heraeus Quarzglas chemical purity

* Components manufactured by **SCP SCIENCE**.

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