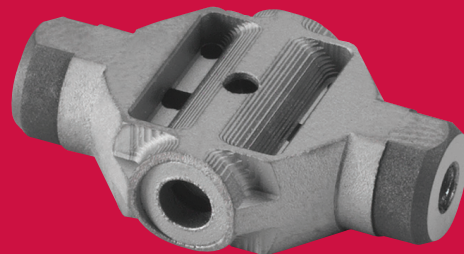


# THGA Graphite Furnace AA – Automatic Matrix Modification for Improved Analytical Quality and Sample Throughput

## Atomic Absorption



The matrix modification technique is a very important feature in the concept of interference-free trace metal determinations. Applying this technique, the chemical forms, and thereby the physical properties, of the element under study and/or the matrix, can be changed by adding a suitable reagent in excess to the sample and standard reference solutions.

### Matrix modification

- Decreases the volatility of the analyte element and prevents its loss during thermal pretreatment. This also allows application of higher pretreatment temperatures for better matrix removal.
- Increases the volatility of matrix components and promotes their removal before atomization. PerkinElmer furnace autosamplers feature automatic matrix modification with the ability to apply one or more matrix modifiers sequentially or simultaneously.

The following tables provide detailed information on how to prepare the most common matrix modification solutions.

**Table 1. THGA Graphite Furnace: Matrix Modifiers for Routine Applications.**

Modifier	Major Application	Absolute Mass Required	Stock Reagents Required	Working Solutions (for a 5- $\mu$ L modifier addition)	
				Preparation	Concentration
Pd + Mg(NO <sub>3</sub> ) <sub>2</sub>	Ag, As, Au, Bi, Cd, Cu, Ga, Ge, Hg, In, Mn, Sb, Se, Sn, Te, Tl	5 $\mu$ g Pd	1% (10 g/L) Pd*	Dilute 1 mL of Pd stock solution and 0.1 mL of Mg stock solution to 10 mL with 18 M $\Omega$ deionized water.	0.1% (1 g/L) Pd
		+ 3 $\mu$ g Mg(NO <sub>3</sub> ) <sub>2</sub>	+ 1% (10 g/L) Mg**		+ 0.06% (0.6 g/L) Mg(NO <sub>3</sub> ) <sub>2</sub>
Pd + Mg(NO <sub>3</sub> ) <sub>2</sub>	P	20 $\mu$ g Pd	1% (10 g/L) Pd*	Dilute 4 mL of Pd stock solution and 0.17 mL of Mg stock solution to 10 mL with 18 M $\Omega$ deionized water.	0.4% (4 g/L) Pd
		+ 5 $\mu$ g Mg(NO <sub>3</sub> ) <sub>2</sub>	+ 1% (10 g/L) Mg**		+ 0.1% (1 g/L) Mg(NO <sub>3</sub> ) <sub>2</sub>
Mg(NO <sub>3</sub> ) <sub>2</sub>	Al, Be, Co, Cr Fe, Si	15 $\mu$ g Mg(NO <sub>3</sub> ) <sub>2</sub>	1% (10 g/L) Mg**	Dilute 0.5 mL of Mg stock solution to 10 mL with 18 M $\Omega$ deionized water.	0.3% (3 g/L) Mg(NO <sub>3</sub> ) <sub>2</sub>
Mg(NO <sub>3</sub> ) <sub>2</sub>	Zn	5 $\mu$ g Mg(NO <sub>3</sub> ) <sub>2</sub>	1% (10 g/L) Mg**	Dilute 0.17 mL of Mg stock solution to 10 mL with 18 M $\Omega$ deionized water.	0.1% (1 g/L) Mg(NO <sub>3</sub> ) <sub>2</sub>
NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> + Mg(NO <sub>3</sub> ) <sub>2</sub>	Cd, Pb	50 $\mu$ g NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub>	Use either:	A: Dilute 1 mL of NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> stock solution and 0.1 mL of Mg stock solution to 10 mL with 18 M $\Omega$ deionized water. or B: Dissolve 10 g NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> in 18 M $\Omega$ deionized water and make up to 100 mL. Dilute 1 mL of this solution and 0.1 mL of Mg stock solution to 10 mL with 18 M $\Omega$ deionized water.	1.0% (10 g/L) NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub>
		+ 3 $\mu$ g Mg(NO <sub>3</sub> ) <sub>2</sub>	A: 10% (100 g/L) NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> liquid*** + 1% (10 g/L) Mg** or B: solid ultrapure NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> + 1% (10 g/L) Mg**  Caution: do not use (NH <sub>4</sub> ) <sub>2</sub> HPO <sub>4</sub>		+ 0.06% (0.6 g/L) Mg(NO <sub>3</sub> ) <sub>2</sub>

**Table 2. THGA Graphite Furnace: Matrix Modifiers for Special Applications**

Modifier	Major Application	Absolute Mass Required	Stock Reagents Required	Working Solutions (for a 5- $\mu$ L modifier addition)	
				Preparation	Concentration
Use either: A: 95% Ar + 5% H <sub>2</sub> or B: HNO <sub>3</sub>	Halide matrices (e.g., NaCl)	Used as an alternate internal gas during dry and pyrolysis steps	None		
		NA	Ultrapure conc. HNO <sub>3</sub>	To 80 mL 18 M $\Omega$ deionized water, add 20 mL conc. HNO <sub>3</sub>	20% (v/v) HNO <sub>3</sub>
				For a 10- $\mu$ L modifier addition	
CH <sub>3</sub> OH HF HNO <sub>3</sub>	Boric acid matrix	10 $\mu$ L CH <sub>3</sub> OH + 0.2 $\mu$ L conc. HF + 0.2 $\mu$ L conc. HNO <sub>3</sub>	CH <sub>3</sub> OH + conc. HF + conc. HNO <sub>3</sub>	10 mL CH <sub>3</sub> OH + 200 $\mu$ L conc. HF + 200 $\mu$ L conc. HNO <sub>3</sub> and mix all	

\* Part No. B0190635

\*\* Part No. B0190634

Note: 1% Mg corresponds to 6% Mg(NO<sub>3</sub>)<sub>2</sub> or 10.5% Mg(NO<sub>3</sub>)<sub>2</sub> • 6H<sub>2</sub>O

1  $\mu$ g Mg(NO<sub>3</sub>)<sub>2</sub> corresponds to 0.17  $\mu$ g Mg or 1.75  $\mu$ g Mg(NO<sub>3</sub>)<sub>2</sub> • 6H<sub>2</sub>O

\*\*\* Part No. N9303445

PerkinElmer, Inc.  
940 Winter Street  
Waltham, MA 02451 USA  
P: (800) 762-4000 or  
(+1) 203-925-4602  
www.perkinelmer.com



For a complete listing of our global offices, visit [www.perkinelmer.com/ContactUs](http://www.perkinelmer.com/ContactUs)

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