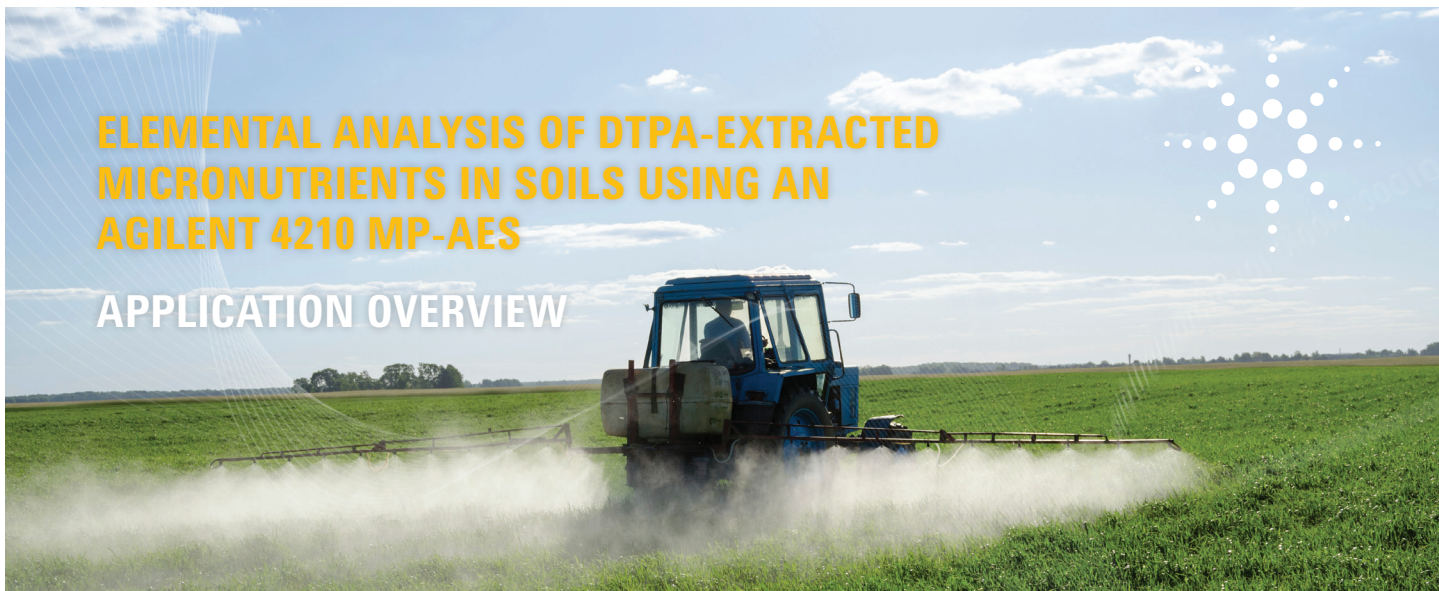# ELEMENTAL ANALYSIS OF DTPA-EXTRACTED MICRONUTRIENTS IN SOILS USING AN AGILENT 4210 MP-AES

APPLICATION OVERVIEW

Agilent's 4210 Microwave Plasma Atomic Emission Spectrometer (MP-AES)

Introduction

The Agilent 4210 MP-AES is well suited to the analysis of agricultural samples, including soil analysis for the determination of micronutrients (Cu, Fe, Mn and Zn) following a DTPA extraction method.

Key benefits for micronutrient soil analysis

Cost-effective analysis: The MP-AES is ideal for agricultural laboratories looking to reduce operating costs, as the instrument uses nitrogen gas from either a Dewar or the Agilent 4107 Nitrogen Generator for the plasma emission source, eliminating the ongoing supply of expensive gases.

Improved safety: Eliminates the need for flammable gases such as acetylene, enabling unattended analysis.

Excellent performance for difficult samples: The stable microwave plasma is capable of analyzing complex matrices such as DTPA soil extracts or soil digests containing elevated total dissolved solids (TDS).

Multi-elemental analysis: MP-AES provides improved analytical performance for multi-element methods, lower detection limits and wide calibration range compared to Flame Atomic Absorption Spectroscopy.

Easy-to-use: The intuitive MP Expert software and plug-and-play torch simplify instrument setup, and allow method development with minimal training required.

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Analysis example

A dried and ground soil sample was prepared following a DTPA extraction method and analyzed for micronutrient analysis on the 4210 MP-AES, with results shown below:

Table 1. Linear calibration range and correlation coefficients for Cu, Fe, Mn and Zn.

Element & wavelength (nm)	Concentration range (μg/mL)	Calibration fit	Correlation coefficient
Cu 324.754	0.5-5	Linear	1.000
Fe 259.940	10-100	Linear	0.999
Mn 257.610	5-50	Linear	0.999
Zn 213.857	0.5-5	Linear	0.999

Intensity = 123308.73512196 * Concentration + 0.22508352
Correlation coefficient: 1.00000
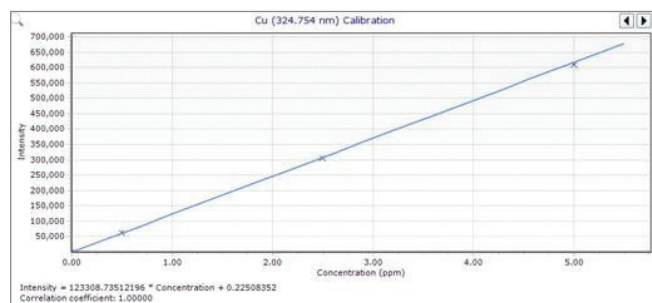
Figure 1. The calibration curve for Cu 324.754 nm shows excellent linearity across the calibrated range with a correlation coefficient of 1.00000.

Table 2. Method Detection limits at a sampling weight of 10 g and spike recoveries for all elements in DTPA extracted soil sample.

Element & wavelength (nm)	MDL (mg/kg)	Soil sample conc (mg/kg)	Spiked conc (mg/kg)	Measured spike conc (mg/kg)	Recovery (%)
Cu 324.754	0.06	0.43	5	4.58	92
Fe 259.940	0.03	22.81	40	36.46	91
Mn 257.610	0.03	6.56	20	18.09	90
Zn 213.857	0.05	0.23	5	4.62	92

Results demonstrate:

- High analytical performance with excellent MDLs and spike recoveries for all elements within ±10% of the target values

- Excellent linearity across a wide concentration range

- Excellent long term stability, with less than 2% RSD over a 3-hour period

To download full application note:

Go to: http://www.agilent.com/cs/library/applications/5991-7250EN.pdf

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