

Evaluation of Mineral Supplements for Content and Purity by Flame/Graphite Furnace AAS

Doctors, dieticians and health officials recommend a balanced diet that provides essential minerals for proper nutrition in the human body. The accurate analysis of metals in vitamin/mineral preparations and food supplements is very important. These metals can be classified into several groups - the major electrolytes (Na, K, Ca, Mg), crucial to normal primary physiological processes like cellular activity and metabolism; the minor minerals (Fe, Mn, Zn, Cu), present in lower levels to act as metabolic agents and enzyme catalysts; and the micro (trace) minerals, in low levels (Se, Cr, Mo), for less defined reactions. There is a need for an analytical tool to quantitate these elements easily and reproducibly. Ferrous gluconate is a source of iron, but can be contaminated with manganese, titanium and vanadium. Dolomite is an excellent source of calcium and magnesium, but is often contaminated with lead and silver. Zinc oxide provides an essential form of easily absorbed zinc, though the amount of cadmium and arsenic found can be a problem.

Examining some of the common over-the-counter and prescription formulations, one can see that the potential contaminants present in some of these higher concentration minerals is as important as the accurate determination of these essential minerals

themselves. For this type of low-level analysis in such a complex matrix (high organics and alkali elements), graphite furnace atomic absorption spectroscopy (GFAAS) with deuterium background correction (D2) is one of the few acceptable techniques for error-free determination of trace metals. GFAAS is also the preferred technique for measuring the desired micro-minerals. The electrolyte metals and minor minerals are best done by simple flame AA (FAAS).

Both flame and furnace techniques can suffer from tremendous interferences when low level elements are determined in "dirty" or complex matrices. The alkali elements (Na, K, Mg, Ca) and the refractory metals (Al, Si) can create background effects that will add significant inaccuracies to an analysis. The presence of organic materials in the sample matrix can cause the formation of smoke particulates in a graphite furnace analysis and cyanogen bands in a flame method; which also contribute to analytical errors. The nature of these interferences can be compensated for by the use of an efficient D2 Background Correction system; and the unique design of the Buck 210VGP AA system provides the maximum energy throughput for maximum sensitivity and accuracy.

Analyst: Gerald J. DeMenna

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Samples: 1) An enriched Wheat Flour; 2) A Multi-Vitamin & Mineral Capsule; 3) A Dolomitic Limestone [a natural Calcium and Magnesium source]; and 4) A Mineral Supplement Concentrate

Preparation: Dissolve 1 gram of sample or 1 capsule in 100ml 5% Nitric Acid. Filter and dilute to 50ml to make a 1:50 dilution, or a 2% solution to be used for **trace** elements. Dilute 1ml of this to 100ml for a 1:5,000 sample dilution for the **electrolytes** and **major** metals.

Calibration: Buck Certified standards at 5 ppm [Flame] and 0.1 ppm with modifiers for [Furnace].

Instrument: Buck 210VGP AA with the 220 Graphite Furnace and 420 Hydride accessories as noted.

Conditions: Flame for Na, K, Mg, Ca, Cu, Zn, Fe, Mn
Hydride for Se & As
Furnace for Cr, Mo, Ag, Pb & Cd
Values are notes as Percent, ppm or ppb in the **original** sample; or mcg in the capsule.

Element	Wave-Length	Detection Limit	Flour	Capsule	Lime	Conc
Sodium	589nm	0.5ppm	2,575ppm	< 10 mg	0.83%	255ppm
Potassium	766	2.0ppm	4,150ppm	15 mg	0.24%	810ppm
Magnesium	285	0.05ppm	375ppm	20 mg	9.82%	175ppm
Calcium	422	1.0ppm	1,500ppm	100 mg	17.2%	75ppm
Copper	324nm	0.05ppm	21ppm	120 mcg	0.09%	550ppb
Iron	248	0.10ppm	315ppm	100 mg	0.35%	1070ppm
Manganese	257	0.10ppm	46ppm	1.5 mg	0.18%	58ppm
Zinc	214	0.05ppm	185ppm	5 mg	1.04%	245ppm
*Arsenic	194nm	10ppb	< 10ppb	< 5 mcg	47.5ppm	< 10ppb
Selenium	196	25ppb	69ppb	7.9 mcg	16.3ppm	78ppb
Chromium	357nm	50ppb	3.8ppm	12.5 mcg	0.33%	155ppb
*Lead	283	25ppb	< 25ppb	< 10 mcg	0.29%	< 25ppb
*Silver	328	10ppb	1.7ppm	< 5 mcg	0.12%	< 10ppb
*Cadmium	228	5.0ppb	< 5ppb	< 2 mcg	665ppm	< 5ppb
Molybdenum	313	50ppb	2.4ppm	9.3 mcg	0.09%	165ppb

Basic System: \$12,950.00

Turnkey System: \$29,684.00

Includes: 210VGPAA, 220 Graphite Furnace, 420 Hydride Generator, all recommended lamps, standards, and accessories for normal operation.

For detailed configuration, refer to Quote #AA4011

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