

QUICK AND FLEXIBLE ELEMENTAL SCREENING WITH OMNIAN IN ONLY 3 MINUTES



Introduction

Omnian, developed for Malvern Panalytical's high-end XRF spectrometers, is also available for the Epsilon 4 EDXRF benchtop systems. This powerful combination brings together the strengths of Omnia with the ease-of-use of Epsilon 4. Omnia is designed to provide fast, reliable quantification in the default 'black box' mode. However, the data collected is comprehensive and can be reviewed in further detail if required.

This application note demonstrates the capability of Omnia for the analysis of a variety of industry-related samples, such as cement, metals, oils and geological samples, using default settings in only 3 minutes per sample. Omnia's advanced Fundamental Parameters (FP) algorithm automatically deals with the analytical challenges posed by samples of widely different compositions from a variety of sources.

Omnian's friendly user interface offers scalable solutions for routine to advanced usage. Minimal steps are required for operation: enter the sample ID, enter preparation details if required and press the 'measure' button.

Cement

A cement standard (NIST 1885a) was prepared as a fused bead and measured with the default Omnia settings, selecting loss on ignition (LOI) as the balance. The measured concentrations are compared with the certified concentrations in **Table 1** and show a good correlation.

Table 1. Omnia results compared to certified values of a cement standard, prepared as fused bead. (*) indicates a reference value only.

Cement	Measured concentration (wt%)	Certified concentration (wt%)
Na ₂ O	0.643	1.068
MgO	3.727	4.033
Al ₂ O ₃	3.798	4.026
SiO ₂	20.939	20.909
P ₂ O ₅	0.086	0.122
SO ₃	2.815	2.830
K ₂ O	0.236	0.206
CaO	63.02	62.39
TiO ₂	0.201	0.195
Cr ₂ O ₃	0.0220	0.0195
Mn ₂ O ₃	0.0450	0.0478
Fe ₂ O ₃	2.030	1.929
ZnO	0.0050	0.0029*
SrO	0.753	0.638
LOI	1.68	1.68

Metals

A low alloy steel standard (BAS SS404/1) was analyzed to illustrate Omnia's performance when analyzing metals (see **Table 2**). The only sample preparation that was used was cleaning the surface with fine sandpaper.

Table 2. Omnia results compared to certified values of a low alloy steel standard

Low alloy steel	Measured concentration (wt%)	Certified concentration (wt%)
Si	0.73	0.87
P	0.034	0.057
Si	0.027	0.024
V	0.11	0.11
Cr	0.53	0.48
Mn	0.35	0.31
Fe	97.22	N.A.
Ni	0.42	0.40
Cu	0.32	0.34
Mo	0.26	0.31

Comparison of the measured and certified concentrations show that Omnia can reliably analyze major and minor elements in metals. Even better results can be expected when using the advanced features within the software.

Fuels, oils and petrochemicals

A lubricating oil standard from VHGLabs Inc. (Lube Oil 16) was chosen to show Omnia's fuel, oil and petrochemical analysis capabilities. Five milliliters were put into a disposable liquid cup for analysis. CH₂ was calculated automatically as a balance compound by the Omnia software (see **Table 3**).

Table 3. Omnia results compared to certified values of lubricating oil standard from VHGLabs Inc

Lubricating oil	Measured concentration (wt%)	Certified concentration (wt%)
Mg	0.062	0.069
Si	0.021	0.025
S	0.925	0.987
Cl	0.002	0.001
Ca	0.413	0.395
Zn	0.014	0.012
Mo	0.000	0.000
Ba	0.031	0.026
CH ₂ (wt%)	98.53	N.A.

The results in **Table 3** demonstrate excellent agreement between certified and measured values for minor to trace concentrations in a liquid sample.

Geological

A stream sediment standard (GSD11) was analyzed to represent Omnian's geological analysis capabilities. The standard was prepared as a pressed powder pellet with 10 grams of sample and 2 grams of wax binder.

The results in **Table 4** demonstrate the power of Omnian at determining the concentrations of major, minor and even trace elements in geological types of sample.



Table 4. Omnian results compared to certified values of a stream sediment standard, prepared as a pressed powder sample

Stream sediment	Measured concentration (wt%)	Certified concentration (wt%)
Na ₂ O	0.46	0.46
MgO	0.56	0.62
Al ₂ O ₃	11.73	10.37
SiO ₂	75.40	76.25
P ₂ O ₅	0.016	0.026
SO ₃	0.230	0.043
Cl	0.037	0.029
K ₂ O	3.37	3.28
CaO	0.35	0.47
Ti	0.175	0.210
V	0.003	0.005
Cr	0.003	0.004
Mn	0.216	0.249
Fe ₂ O ₃	4.20	4.39
Cu	0.007	0.008
Zn	0.032	0.037
As	0.015	0.019
Rb	0.039	0.041
Sr	0.003	0.003
Y	0.004	0.004
Zr	0.014	0.015
Nb	0.002	0.003
Sn	0.048	0.037
Ba	0.023	0.026
W	0.009	0.013
Pb	0.060	0.064
Bi	0.005	0.005
Th	0.002	0.002
H ₂ O/CO ₂	3.00	N.A.

Conclusion: This application note demonstrates the ability and flexibility of Omnian at analyzing solids, powders and liquids, using the default settings. In combination with an Epsilon 4 EDXRF spectrometer, Omnian can quickly screen major, minor and trace elements within 3 minutes. The combination of excellent detector resolution, high sensitivity and powerful software deconvolution models contribute to the accuracy and speed of the results.



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