Optical Emission Spectrometer OE Series

Application Test Report 10 – September 2026

HITACHI

Analysis of Aluminum Sows with Optical Emission Spectrometry (OES)

Executive Summary

Aluminum is in growing demand due to several factors. It is frequently turned to as a key material in vehicle lightweighting to achieve fuel efficiency standards for internal combustion engine vehicles and to deliver performance for electric vehicles. Renewable-energy infrastructure utilizes aluminum in solar panels, wind turbines, and the electrical grid. Aluminum demand also tracks with construction growth, particularly in developing regions experiencing rapid urbanization, due to Aluminum's durability, low maintenance requirements, and lightweight properties.

Making it even more attractive to industry and government, aluminum plays a major role in the circular economy, as it is essentially infinitely recyclable. This rapid growth puts stress on smelting facilities and recyclers to produce—and analyze—aluminum throughout its lifecycle.

The Hitachi OE Series spectrometers quickly and easily analyze main alloying elements and traces in aluminum, allowing smelters and producers to verify the elemental composition of a charge or batch melt, check incoming material, and characterize internal scrap.

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Analytical Solution

The OE Series covers the spectrum of elements in metals with low detection limits and state-of-the-art multi-CMOS technology. These spark spectrometers allow you to analyze all main alloying elements and identify exceptionally low levels of tramp, trace and treatment elements in metals.

Fast measurement times, high reliability and low operating costs mean the OE Series is invaluable for everyday analysis and total quality control, with performance on par with larger and more expensive spectrometers.

OES is a trusted analytical technique across all phases of metal production – from primary production through recycling – because minimally trained users can achieve highly accurate results for a wide range of elements, down to the ppm level, in a matter of seconds.

OES is frequently complemented by portable LIBS (e.g., Hitachi Vulcan) and XRF (e.g., Hitachi X-MET8000) analyzers to analyze or inspect sows, scrap, and pieces far from the lab.

Key benefits of using OE Series

- Analyzes metals and alloys with low detection limits for critical, residual, trace, tramp and inoculating elements
- High-resolution CMOS technology
- Extensive result, reporting, and processing options
- Excellent long-term stability, ensured by peak-position alignment (PPA)
- Low operating costs

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Background

The production and use of aluminum sows involve critical testing. Scrap and other feed must be carefully and thoroughly characterized to ensure the correct chemistry is achieved, and the furnace is sampled to verify that the charge calculations were correct. After they're shipped downstream to foundries, mills, and extruders, the sows will be tested again to verify that the correct material was received and is stored in the proper location.

Properties of aluminum sows are defined by the composition of alloying elements, including minor elements, traces, and impurities While the target composition range is specified by the grade or requested chemistry, the potential exists for mismatches, mistakes, unexpected impurities, or contamination. Producers and downstream customers rely on rapid, accurate testing or inspection by OES to deliver the needed mechanical properties, corrosion resistance, and formability.

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Analysis Data

Factory-loaded empirical calibrations were used to measure an aluminum alloy on the OE750. Sample preparation is important for accurate and precise OES results. A flat, clean surface is essential. The sample was prepared on a milling machine with indexable inserts specified for aluminum alloys.

Table 1. Analysis of Selected Elements in a Cast Aluminum Sample

Burn	Al (wt%)	Si (wt%)	Fe (wt%)	Cu (wt%)	Mn (wt%)	Mg (wt%)	Zn (wt%)	Cr (wt%)	Ni (wt%)	Ti (wt%)	Pb (wt%)	Sn (wt%)	Sr (wt%)	V (wt%)	P (wt%)
1	85.64	9.440	0.7850	2.8900	0.2020	0.2330	0.2980	0.0495	0.1570	0.0538	0.0501	0.0521	0.0636	0.0270	0.0030
2	85.57	9.440	0.7940	2.9400	0.1980	0.2340	0.3040	0.0496	0.1600	0.0532	0.0505	0.0537	0.0625	0.0267	0.0034
3	85.65	9.380	0.7890	2.9300	0.1980	0.2320	0.3010	0.0499	0.1590	0.0532	0.0499	0.0529	0.0625	0.0268	0.0032
4	85.74	9.300	0.7880	2.9300	0.1990	0.2300	0.2990	0.0506	0.01590	0.0536	0.0505	0.0530	0.0621	0.0268	0.0029
5	85.64	9.410	0.7930	2.9100	0.2000	0.2310	0.3010	0.0498	0.1600	0.0536	0.0501	0.0523	0.0625	0.0268	0.0031
6	85.59	9.400	0.7970	2.9500	0.1980	0.2320	0.3020	0.0505	0.1630	0.0533	0.0506	0.0533	0.0624	0.0267	0.0034
7	85.61	9.420	0.7920	2.9300	0.1990	0.2330	0.2990	0.0502	0.1610	0.0536	0.0495	0.0535	0.0618	0.0272	0.0034
8	85.55	9.440	0.8030	2.9600	0.1970	0.2320	0.3030	0.0494	0.1620	0.0538	0.0488	0.0532	0.0613	0.0268	0.0031
9	85.56	9.460	0.7900	2.9400	0.2000	0.2320	0.2980	0.0503	0.1600	0.0539	0.0494	0.0534	0.0627	0.0266	0.0030
10	85.63	9.390	0.7880	2.9500	0.1980	0.2320	0.3020	0.0501	0.1610	0.0532	0.0492	0.0531	0.0609	0.0265	0.0031
Average	85.62	9.410	0.7920	2.9300	0.1990	0.2320	0.3010	0.0500	0.1600	0.0535	0.0499	0.0531	0.0622	0.0268	0.0032
Certified reference value	n/a	9.45	0.793	2.91	0.2	0.233	0.3	0.05	0.16	0.054	0.051	0.052	0.064	0.027	n/a
Standard deviation	0.057	0.047	0.0050	0.0210	0.0014	0.0011	0.0020	0.0004	0.0017	0.0003	0.0006	0.0005	0.0008	0.0002	0.0002

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Summary

Both mobile and stationary OES analyzers perform elemental analysis of aluminum sows in a matter of minutes. The OE Series is invaluable tool for performing production and quality control in a laboratory near the furnace, and the mobile PMI-MASTER Series provides rapid incoming inspection with lab-grade performance.

Questions?

Contact **Hitachi High-Tech America Inc.** at hha.contact@hitachi-hightech.com. You can find more information on our website : Mobile OES Analyzer | Benchtop OES Analyzer | Optical Emission Spectrometer | PMI-MASTER Pro | OE720 | OE750 | Hitachi High-Tech

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