Benchtop XRF Analyzer LAB-X5000

Application Test Report 9 – August 2026

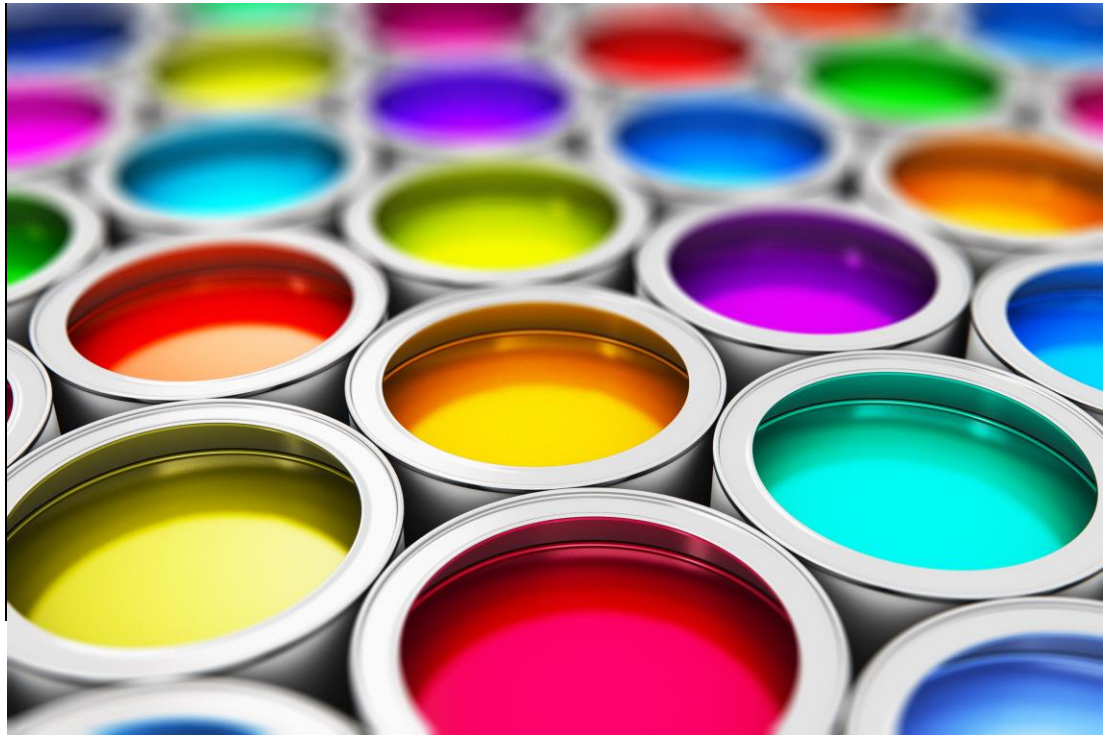
HITACHI

Analysis of Paint Additives with Benchtop XRF

Executive Summary

The global paint and coatings market is a massive, yet rapidly growing segment in the industrial chemicals space, driven largely by infrastructure expansion and modernization, and growth in aerospace and automotive production. These coatings perform a range of essential functions. While there is a component of aesthetics, paints and coatings are formulated with additives that are tasked with protecting structures and mechanical components from corrosion and other environmental impacts.

The Hitachi LAB-X5000 is a compact benchtop XRF that provides rapid, non-destructive analysis of additives in paints. Designed for simple operation in production environments and laboratories—without the need for sample preparation—the LAB-X5000 is a valuable tool for production and quality control.



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Analytical Solution

The LAB-X5000 is a highly flexible and powerful energy-dispersive XRF spectrometer for quality assurance and process control across a wide range of applications. Its strength comes from its simplicity and robustness, with a streamlined interface making it easy for any operator to get repeatable results with a single touch of a button. The LAB-X5000 can be set up to measure in air path, but can be configured with an optional helium purge to improve detection limits for lighter elements (Na – Cl).

XRF is widely used across many industries to analyze the composition of bulk materials because of its flexibility to measure one or many elements in a wide concentration range (low ppm to nearly 100%) in a matter of minutes, typically without the need for any chemical sample preparation or specialized tools. There is little training needed in order to get good results. Once a calibration has been created, operators need only load a sample into the XRF and start the measurement.

Key benefits of using LAB-X5000

- Rapid analysis for quick feedback on material composition and quality
- Spill prevention with an automated turntable that moves the sample away from key components
- Rugged design with robust, field-proven components for use in harsh facilities
- Low operating costs
- Rugged integrated touchscreen and intuitive user interface
- Easy to use: reliable results with minimal operator training

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Background

Paint producers for architectural, commercial, transportation, and industrial finishers have many objectives in mind when they formulate the paint, ultimately with the goal of having the paint look good, protect the material it's applied to, and perform for the intended lifetime. They must consider environmental conditions—including varying weather and UV exposure, long-term stability, how it will be processed at the end of its usefulness, ease and cost of manufacture, and of course, color and finish.

The composition of additives based on titanium, zinc, zirconium, copper, and other metals must be controlled in a paint formulation. If too little is added, the paint will not deliver the intended functional or aesthetic qualities, or may do so for an unexpectedly shortened period. If too much is added, or if multiple additives are not in the right proportions, some features may not achieve their desired performance, and producers may overspend on chemicals. Quality control of these additives by XRF is an essential part of ensuring that paints look and behave according to the producer's specifications.

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Analysis Data

Empirical calibrations were created for two different paint chemistries: one including titanium- and iron-based compounds; one including an aluminum-based compound. Samples were poured into standard sample cups that were placed inside a secondary safety window to reduce the risk of spills. Measurement time was 60 seconds for the samples containing Ti and Fe, and 30 seconds for the samples containing Al. Other elements from the formulations were present in the samples, but were not quantified for this study.

Table 1. Static Analysis of Ti and Fe in Paint

Analysis	Ti (wt%)	Fe (wt%)
1	16.58	24.15
2	16.63	24.20
3	16.61	24.20
4	16.70	24.23
5	16.62	24.20
Average	16.63	24.20
Precision	0.089	0.058
Expected	16.70	24.40

Table 2. Static Analysis of Al in Paint

Analysis	Al (wt%)
1	0.50
2	0.51
3	0.49
4	0.52
5	0.51
Average	0.51
Precision	0.023
Expected	0.50

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Summary

The LAB-X5000 can perform elemental analysis for one or multiple additives in paints in a matter of minutes. The
LAB-X5000 is an invaluable tool for performing quality control, either on the production floor or in a laboratory.

Questions?

Contact **Hitachi High-Tech America Inc.** at hha.contact@hitachi-hightech.com.
You can find more information on our website : Benchtop XRF Analyzer | X-ray Fluorescence | LAB-X5000 | Hitachi High-Tech

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