

The Z: Discovering and Ending your 6063 and 1100 Mix-ups.

We've visited hundreds of scrap sorting operations with our laser-based analyzer. One thing stands out. Many sorting operations relying on X-ray are routinely mixing their 6063 and 1100, thus not getting the full value from their more pure aluminum material in their possession. A large percentage of the aluminum volume in many operations is 6061, 6063 and 1100 so there's often a lot of money left on the table. Here's why:

First consider the specs of the main alloying elements, and their differences, in 1100 and 6063. The key to sorting these is measuring the Mg content in 6063. Many X-ray guns are tuned to classify a mostly pure Al alloy with low Cu as an 1100. This is because X-ray requires 30-60 seconds to measure the Mg (depending on the brand) and a dual-beam operation. Recyclers are not going to wait the full 30-60 seconds for that Mg measurement with X-ray.

	Mg	Si	Cu
6063	0.45-0.90	0.2 – 0.6	0-0.1
1100	-	0 – 0.75	0.05 – 0.2

table 1

The rule of thumb used by X-ray, that a mostly pure Al with low Cu is 1100, is less true now. More of the 6063 product is made from recycled material, thus the Cu content has crept up. We routinely see 6063 near the 0.1% Cu max and sometimes even higher, close to 0.15%. X-ray guns that aren't making the long test time for Mg will generally misclassify such 6063 as 1100 by relying on the Cu. An inexperienced X-ray operator will often end the test prematurely, thus not waiting long enough for the Mg measurement. If you're doing short X-ray tests on your aluminum alloys, you may be leaving a lot of money on the table.

Laser-induced Breakdown Spectroscopy (LIBS) offers an alternative technique to both handheld XRF and spark OES for the analysis of a broad range of elements and materials. SciAps is pleased to introduce the Z, a handheld analyzer featuring our laser-based LIBZ technology. The Z delivers the low atomic number performance of mobile OES, while maintaining the portability of handheld XRF. Key features of the Z include a) a pulsed, 6 mJ, 50 Hz laser, b) novel 50 Hz burst cleaning to eliminate sample grinding, and c) Opti-Purge™ on-board argon purge for 10x or better precision. The Z can also be equipped for ONLY air-burn analysis for sites with compressed gas canister restrictions.



Faster, more Reliable Sorting of 6061, 6063 and 1100 Aluminum Alloys:

The Z sorts aluminum alloys in typically 1 second tests with no grinding or other sample prep. It especially excels at measuring Mg, Al and Si and thus will quickly and accurately sort out your 6063, 1100 and other alloys – thus avoiding the mix-ups of 1100 and 6063 while also maintaining a high throughput volume due to the fast tests.

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SciAps Application Note
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Repeatability performance data is shown in Table 2. As shown, Mg content in 1100 is less than 0.02% as expected, whereas the Mg content in 6063 averages about 0.5% as expected. Fast, precise Mg analysis is critical to productively sorting 6063 and 1100, as it is with other close grades like 2014 and 2024, 3003/3004/3005. As shown in the repeatability data, the Al content, measured by difference, is measured with very high precision to 99.17% +/- 0.04%. 1100 requires a minimum Al content of 99%. The high precision measurements the Z provides make it possible to also sort within the 1000 series aluminum alloy range.

	1100				6063			
	Mg (%)	Al (%)	Si (%)	Cu (%)	Mg (%)	Al (%)	Si (%)	Cu (%)
	0.013	99.21	0.111	0.055	0.493	98.58	0.382	0.102
	0.013	99.17	0.117	0.090	0.518	98.58	0.373	0.101
	0.014	99.13	0.121	0.078	0.572	98.53	0.392	0.093
	0.017	99.13	0.112	0.093	0.465	98.72	0.358	0.092
	0.013	99.23	0.107	0.082	0.516	98.53	0.367	0.106
	0.013	99.16	0.107	0.081	0.476	98.69	0.353	0.094
	0.013	99.21	0.111	0.072	0.531	98.51	0.422	0.100
	0.013	99.21	0.113	0.066	0.558	98.54	0.396	0.103
	0.014	99.11	0.118	0.066	0.533	98.45	0.426	0.117
	0.013	99.19	0.117	0.085	0.502	98.62	0.372	0.113
	0.013	99.19	0.109	0.065	0.498	98.65	0.369	0.090
Average	0.013	99.176	0.113	0.076	0.515	98.582	0.383	0.101
Std. Dev	0.0013	0.0396	0.0046	0.0118	0.0328	0.0816	0.0241	0.0085

table 2



The Z also uses traditional calibration curves based on intensity ratios, unlike other laser based analyzers. The Z also offers Type Standardization analysis, and provides the operator with complete access to line ratios, calibration curves, and spectral pre-processing.

An example of the Mg and Cu calibration curves are shown in Figures 1 and 2, respectively. The Z offers multiple curves over wider concentration ranges. The curves shown are for the lower concentrations, 0 – 1% nominally.

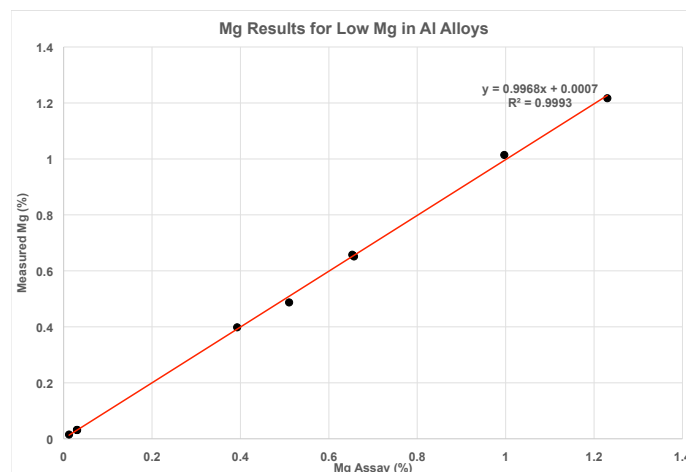


fig. 1

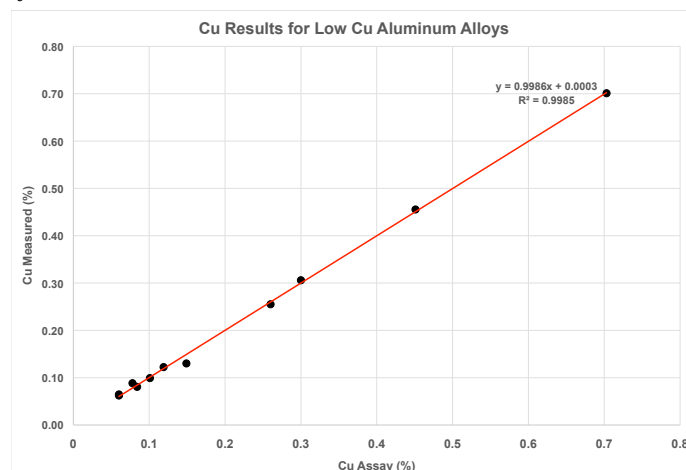


fig. 2

Summary:

The Z is the world's most advanced handheld LIBS analyzer. The Z possesses the three key requirements for successful, in-field analysis of a range of materials: a) burst cleaning to eliminate sample surface effects and grinding, b) argon purge (optional) for 10x or more precision compared to air-based analysis, and c) beam rastering. This combination provides proven performance on a range of materials such as, aluminum alloys, red metals, nickel and stainless and ferrous. The novel sample detection system allows the device to be operated under Class 1 conditions, thus eliminating the regulatory requirements of x-ray and class 3b LIBS devices.