



How to Get the Most from Outsourced Laboratory Testing Services

Manufacturers of inorganic minerals, ceramics, refractories and more can enjoy a wide range of lab testing benefits by following these simple tips.

Have you ever pulled a big mass of slag material out of your kiln or furnace and had no idea what it actually was? Or perhaps more commonly, does your company lack the necessary in-house instrumentation and capabilities for periodic QC/QA analysis? If so, rest assured—you are not alone. From all over the country, companies that produce inorganic minerals, ceramics and refractories are turning to Washington Mills' Laboratory Services Group to provide analyses ranging from simple sieve analysis and loss/gain on ignition (LOI) to the more advanced X-ray fluorescence (XRF) and X-ray diffraction (XRD).

With so many different types of tests—and the multitude of related acronyms!—navigating the testing environment can become somewhat confusing. Following are

some tips to help you get the most from outsourced laboratory testing services.

THERE'S NO SUCH THING AS TOO MUCH INFORMATION

While the experienced chemists and technicians at Washington Mills can certainly handle projects like the mystery slag mentioned previously, it's generally a best practice to provide as much information as possible when submitting a sample for testing. These details help the lab determine which test (or range of tests) can provide the results you're looking for.

Some key considerations to keep in mind include:

- Are you looking for general chemical composition or do you need phase details—or both?

- Is moisture a concern? What about particle size?
- Is the material calcined or is it virgin material?
- Are there specific contaminants that you're worried about?

Having the answers to these questions handy when you contact the lab (or even better, outlining the information in an email) will enable the technicians to more quickly and efficiently handle your testing project(s). The lab may also ask you additional questions, depending on the material you're submitting.

A GENERAL UNDERSTANDING GOES A LONG WAY

By no means do you need to be an expert

in the various available analysis methods in order to work effectively with a testing lab. After all, that's their job, not yours! However, a general understanding of the tests can help you assess which methods will work best for you, and evaluate the results that each method can provide. The Washington Mills Laboratory Services Group provides instrumental, analytical, and physical tests for a variety of materials, including abrasive grain, refractory raw materials, ceramic powders, clays, soil, cement, minerals, and many more.

Instrumental

X-ray fluorescence (XRF) and X-ray diffraction (XRD) can be used separately or together, depending on the type of information you are looking for. XRF analysis provides a list of chemical elements present in a material. For example, an XRF on aluminum oxide might show 85% of that particular oxide, plus much smaller amounts of sodium oxide (soda), a little bit of calcium, and perhaps some titanium. XRF can provide companies with a good quantitative analysis of what is contained in their sample.

After seeing the XRF numbers, companies occasionally might find that they'd like to have some additional detail regarding their sample. That's where XRD often comes into play; XRD can determine the crystallography of the materials in the sample. For example, XRF might find that a sample is 25% silica and 75% alumina, but it can't show how they're combined or if they're two different phases. XRD, on the other hand, can show that the material is not silica and it's not alumina—it's actually aluminum silicate.

While XRD is often used to supplement XRF, it can also be used on its own. Some companies might already have a good idea of what materials they put in their product, and in what amounts. They don't need an XRF to tell them what the sample contains. However, they might want to see what the material looks like after they fire it. Did something happen during the firing process that caused the phases to change? XRD can help answer that question.

Analytical

Analytical testing can involve: sample preparation, loss on ignition, moisture content and total/free carbon. Washington Mills has the ability to reduce your sample from ideally about 2 x 2 in. or so down to pea-sized pieces, and even smaller—to very fine powders. Depending on the material, the sample

may be further processed into a pellet/wafer or bead for specific additional testing.

LOI is used to basically burn off any organics in the sample, as well as any bound moisture that would be recovered from a moisture analysis, and also to convert free metals to their oxide form so they can be further processed. When testing for moisture, the sample is weighed and typically placed in an oven at 110°C for an hour (time and temperatures sometimes vary, depending on the testing standard, material, etc.). The sample is then weighed again to determine the loss.

Total and free carbon testing is used for materials that (not unsurprisingly) include carbon, such as silicon carbide and boron carbide. The free carbon test identifies carbon in its elemental state, while total carbon includes the free carbon plus what is called combined carbon (e.g., silicon carbide). For a very high-quality silicon carbide product, the result will be a very low free carbon value. Essentially, the free carbon value is

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subtracted from the total carbon value and multiplied by a factor to arrive at the percent silicon carbide (ideally, 99-99.5% and higher for a high-quality silicon carbide product).

Physical

The lab can measure a range of your material's physical attributes, including particle size, density, and strength, among others. Washington Mills has several different instruments available for use in particle size analyses, depending on the coarseness of the material to be tested. The Coulter particle size analyzer is used most frequently because it provides excellent results even for smaller particle sizes. In addition, most national standards (e.g., ANSI and FEPA) are based on the Coulter instrument.

Density is typically measured via bulk density or tap density tests. Generally used for coarser material, bulk density is based on a loose fill of the sample material

within the testing vessel. In a tap density test, which is normally done for finer particles, the sample is actually tapped down in the vessel.

Friability testing measures mechanical strength (i.e., how easily a material falls apart), which is helpful to know in cases when the end product needs to remain fairly sturdy. Additional physical tests can be done for attributes such as magnetic content, specific gravity and microhardness.

FIND THE RIGHT PARTNER

Whether your outsourced laboratory testing needs are simple or complex, for a one-time project or regular, ongoing product quality assurance purposes, finding the right lab partner for your operation is key to your success. Speak with multiple labs to determine their capabilities and expertise, and evaluate how well they will be able to meet your requirements.

Do you need a large lab that is ISO certified and provides a broad range of tests?

If so, keep in mind that your costs might be somewhat higher than a smaller lab, and turnaround times will likely be longer. Perhaps a smaller lab could provide the specific testing you need more quickly, and at a more reasonable price.

The Washington Mills Laboratory Services Group serves as the quality control lab for the company's manufacturing operation. This helps keep the lab's costs down while ensuring high-quality results. Turnaround time is generally 1-2 weeks (vs. months, compared to some of the larger labs), and rush service is available for a premium. The experienced and knowledgeable staff at Washington Mills is able to focus on targeted tests for ceramic and refractories manufacturers, and welcomes the opportunity to work with companies on a case-by-case basis to tailor a testing project/program to suit their specific needs. ■