Most digestion procedures for metals in sediment samples prescribed by the EPA and followed by routine environmental laboratories use mineral acids, such as HNO₃ and HCl, to extract the metals that tend to be relatively stable and therefore potentially bioavailable in the environment. Such digestions do not necessarily achieve complete dissolution of all the metals, since some mineral- or chemically-bound metals are resistant to dissolution by these acids. These solute fractions are typically described as the “total recoverable metals” concentrations.

Occasionally, a more comprehensive evaluation is required and the true “total metals” concentrations of solid samples must be determined. The soils and sediments surrounding decommissioned military bases, legacy mining sites, and former chemical manufacturing plants may have extensive metals contamination that are bound up in forms of complex chemical compounds. Industrial feedstock and byproducts are subjected to conditions far more extreme than environmental samples, and often must be tested to evaluate their contribution to the metals concentrations in related waste streams.

Brooks Rand Labs has extensive experience offering a more strenuous digestion process for the determination of true “total metals” in solid samples using a high-temperature, high-pressure extraction with hydrofluoric acid, which can dissolve even the most tightly bound metals.

The reliability of typical digestion procedures for the determination of trace metals in a variety of sample types is usually demonstrated by the analytical recoveries of expected values for individual analytes from various certified reference materials (CRM). However, the availability of CRM types and the range of expected values for specific analytes remain limited. The hydroxylstatistox method matches as closely as might be desired for unique sample types or projects.

Therefore, projects that demand exceptional quality assurance often design digestion procedures particular to specific sample types and program objectives. Employing the latest in microwave digestion technology, Brooks Rand Labs offers the capability to design and perform highly customized digestion procedures using the optimal reagents, temperature, and pressure, over nearly any time scheme. Moreover, our ultra-clean system allows for the constant optical monitoring of reagents, temperature, and pressure, over nearly any time scheme.

As experts in the determination and characterization of trace metals in complex matrices, we have the capabilities to meet even the most challenging project requirements. Ultra-clean, pre-tested sampling equipment delivered directly, fast turn-around-time options, and custom reporting packages at competitive prices ensure that our clients receive the quality data they require to make critical decisions.

Brooks Rand Labs consistently achieves detection and reporting limits that are among the lowest commercially available. Performance based evaluations of laboratory techniques ensure the most accurate and precise measurements at even the lowest concentrations. Ultra-clean facilities, laboratory equipment, and reagents, custom designed state-of-the-art instrumentation, and constantly improving methods allow Brooks Rand Labs to provide meaningful metals concentrations data in even the most challenging matrices.

Outstanding Data Quality

As an ultra-low level trace metals analytical laboratory, Brooks Rand Labs appreciates how important high quality data is for our clients. All our data is subjected to a rigorous multi-level review process to ensure only the most credible and scientifically defensible data is provided to our clients.

The accuracy and precision of our data are constantly proven by internal and client-requested laboratory audits. Consequently, Brooks Rand Labs is proudly NELAP accredited through the State of Florida Dept. of Health and certified in many additional states.

Unparalleled Customer Service

The project management team at Brooks Rand Labs provides clients with an unparalleled level of support from initial project planning, to data validation and interpretation, and project follow-up. They review quality assurance and sampling plans, advise on sampling procedures, and produce custom reporting packages that are superior to other analytical laboratories.
Inductively coupled plasma – mass spectrometry (ICP-MS) is widely recognized as one of the most accurate and precise analytical techniques for the determination of many trace metals in a wide variety of sample types. However, analyses for a small number of these elements using a conventional instrumental configuration have also been persistently challenging due to spectral interferences that can severely compromise the accuracy of reported results.

These spectral interferences occur due to the formation of polyatomic ions that have the same nominal mass as the analyte of interest and that cause erroneously large losses in analytical sensitivity. Moreover, the effects of these interferences are not readily apparent by reviewing the results of typical quality control analyses, such as the recoveries of matrix spikes, since the interferences can contribute to each of the analyses equally.

In some instances, less abundant isotopes that may not be recoverable due to the formation of polyatomic ions that have the same nominal mass as the analyte of interest to a different ionic species with a different nominal mass. The reaction gas and gas flow rates ultimately selected are based upon the predictability of controlled and specific reactions.

A relatively recent advance for overcoming the challenges associated with these interferences, PerkinElmer’s Dynamic Reaction Cell™ (DRC) improves significantly upon conventional analysis by ICP-MS. Located between the ion optics and the mass analyzer vacuum chambers of an ICP-MS instrument, the DRC is an enclosed and positively pressurized chamber with an independent quadrupole that can be configured to nearly eliminate polyatomic spectral interferences.

In a process described as chemical resolution, a highly reactive gas is injected into the DRC chamber, resulting in gas-phase chemical reactions that can either breakdown polyatomic ions into neutral species or convert the analyte of interest to a different ionic species with a different nominal mass. The reaction gas and gas flow rates ultimately selected are based upon the predictability of controlled and specific reactions.

The byproducts of the chemical resolution process may be expressed thusly:

\[
\begin{align*}
\text{ArO}^+ + \text{NH}_3 & \rightarrow \text{Ar} + \text{O} + \text{NH}_3^+ \\
\text{Fe}^+ + \text{NH}_3 & \rightarrow \text{Fe} + \text{NH}_4^+ \\
\end{align*}
\]

Brooks Rand Labs has developed numerous matrix and analyte specific methods employing the DRC to produce some of the lowest detection limits and most accurate data available.

To learn more about our innovative analytical methods and how they can benefit your projects, contact us today.

Phone: 206-632-6206
E-mail: brl@brooksrand.com
Website: www.brooksrand.com
Most digestion procedures for metals in sediment samples prescribed by
the EPA and followed by routine environmental laboratories use
mineral acids, such as HNO₃ and hydrochloric, to extract the metals that
lead to be relatively soluble, and therefore potentially bioavailable in
the environment. Such digestions do not necessarily achieve complete
dissolution of all of the metals, since some mineral- or chemically-bound
metals are resistant to dissolution by these acids. These soluble fractions
are typically described as the “total recoverable metals” concentrations.

Occasionally, a more comprehensive evaluation is required and the
true “total metals” concentrations of solid samples must be determined.
The soils and sediments surrounding decommissioned military bases,
legacy mining sites, and former chemical manufacturing plants may have
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to conditions far more extreme than environmental samples, and often
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in related waste streams.

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Moreover, our ultra-clean system allows for the constant optical monitoring
of temperature and pressure levels for each individual sample,
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Brooks Rand Labs is proudly NELAP accredited through the State of Florida Dept.
of Health and certified in many additional states.

As an ultra-low level trace metals analytical laboratory, Brooks Rand Labs
appreciates how important high quality data is for our clients. All our data
is subjected to a rigorous multi-level review process to ensure only the
most credible and scientifically defensible data is provided to our clients.

The accuracy and precision of our data are constantly proven by internal
and client-requested laboratory audits. Consequently, Brooks Rand Labs is
prudently ISO17025 accredited through the State of Florida Dept.
of Health and certified in many additional states.

About Brooks Rand Labs

Brooks Rand Labs is a specialty metals laboratory offering advanced analytical
services for the determination of trace metals by ICP-MS microscopy and
dynamic reaction cell technology.

Brooks Rand Labs specializes in superior quality trace metals analytical services, Brooks
Rand Labs focuses on metals specialists, trace level detection limits, and the analysis of complex matrices.

Experience & Expertise

Since 1982, Brooks Rand Labs has specialized in providing the highest
type of trace metals analytical services and instrumentation. Low detection
limits, outstanding data quality, and unparalleled customer service have
established Brooks Rand Labs as the premier specialty metals analytical
laboratory services provider.

As experts in the determination and characterization of trace metals
in complex matrices, we have the capabilities to meet even the most
challenging project requirements. Ultra-clean, pre-identified sampling
equipment delivered directly, fast turn-around-time options, and customer
reporting packages at competitive prices ensure that our clients receive
the quality data they require to make critical decisions.

Outstanding Data Quality

As an ultra-low level trace metals analytical laboratory, Brooks Rand Labs
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It is our mission to provide meaningful metals concentrations data in even the
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Advanced Analytical Services

for the Determination of

Trace Metals by ICP-MS

and Dynamic Reaction Cell Technology

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