

The Ohio Lumex Laboratory Statement of Qualifications

Solutions to Complex Analytical Challenges



CONTENTS

MISSION	1
COMMITMENT TO QUALITY	1
PRODUCT & SERVICE SUPPORT	2
SUMMARY OF LABORATORY SERVICES	2
Analysis Services	3
Mercury Analysis	3
HCl/HBr Trap Analysis	3
SO ₃ /H ₂ SO ₄ Analysis	4
NH ₃ Analysis	4
Siloxanes Analysis	4
VOCs Analysis	4
Metals Analysis	4
Major Gas Analysis	4
Speciated and Total Sulfur	5
Select Halocarbons	5
SVOCs	5
PCBs and Organochlorine Pesticides	5
Aldehydes and Ketones	5
Moisture in Biogas and RNG	5
Bacteria (Microbially Influenced Corrosion)	5
Radiological Analysis	5
Field Capabilities	6
Methods Development Services	6
Consulting Services	7
A DEDICATED TEAM OF EXPERTS	8



MISSION

Our Mission is to provide the highest quality, timely and most cost-effective analytical services to a wide range of industries, including:

- ▷ Utilities
- ▷ Cement Plants
- ▷ Chemical Manufacturing
- ▷ Refineries
- ▷ Natural Gas and Compressed Natural Gas
- ▷ Waste to Energy
- ▷ Biogas
- ▷ Renewable Natural Gas (RNG)
- ▷ Environmental Sample Analysis
- ▷ Food & Beverage
- ▷ Materials Analysis and Others

The Ohio Lumex Analytical Laboratory is a NELAP accredited laboratory focused on three core areas – analysis of gases, liquids and solids, methods development, and consulting for the industries we serve. We are the premier laboratory worldwide for the analysis of combustion gas emissions, and gaseous fuels, including Biogas, RNG, CNG, LNG and Natural Gas. The Laboratory is well known for its expertise in Mercury and Siloxanes, including EPA Method 30B, EPA Performance Specification 12B, EPA M7473, and ASTM D8230. We offer the fastest turnaround times in the industry, have a demanding QA/QC process second to none, and have earned a well-deserved reputation for going beyond just analyzing and reporting of results by providing continual support and technical expertise.

- ▷ Analysis
 - ▷ Gases
 - ▷ Liquids
 - ▷ Solids
- ▷ Methods Development
- ▷ Consulting

National
Environmental
Laboratory
Accreditation
Program



COMMITMENT TO QUALITY

The Ohio Lumex Laboratory follows strict policies and procedures established by NELAP, ISO 17025, and developed internally to ensure high-quality data acquisition. Every analytical batch receives detailed attention from sample acceptance to final report delivery. A QA/QC manager reviews and assigns each project to specific instrument parameters for optimal results. Each set of data is independently reviewed to verify that all laboratory QC checks have passed and method requirements have been adhered to. Laboratory management is available to answer any questions you may have about your report.



PRODUCT & SERVICE SUPPORT

The Ohio Lumex Laboratory routinely performs custom analysis and diagnostic services to help clients successfully use our products process control, regulatory compliance, and meeting gas quality specifications. These services include recommendations for modifying sampling parameters or sorbent trap configurations.



SUMMARY OF LABORATORY SERVICES

The Ohio Lumex Laboratory takes pride in our adaptive and agile approach to solving difficult problems. Ohio Lumex's reputation for quickly providing custom-tailored solutions has led to unique and challenging requests from many industries. Our laboratory researchers embrace these challenges, and have a long track record of successfully developing new analytical methodologies which have been applied across various industries. For a small number of analytical services, we partner with a network of trusted laboratories to meet the needs of our customers, increasing the scope of analytical methods we support.



Mercury Analysis

▷ 30B & Hg Speciation Traps

Our Laboratory routinely analyzes EPA Method 30B Total Hg & Speciation sorbent traps for Relative Accuracy Test Audits, 30B LEE compliance, mercury control technology optimization/verification, and other 30B applications. These sorbent traps are analyzed via thermal desorption atomic absorption spectrometry using Ohio Lumex M324 sorbent trap analyzers. Ohio Lumex also produces, spikes, and provides expert guidance on the use of these sorbent traps.

▷ PS 12B Traps

In addition to analysis of Method 30B sorbent traps, our laboratory also specializes in analysis of EPA Performance Specification 12B sorbent traps with extremely fast turnaround times and unparalleled data quality. Our laboratory spikes, customizes, and provides source specific recommendations and troubleshooting support for the use of these sorbent traps.



▷ Gold Traps

Gold sorbent traps are primarily used for mercury measurements in natural gas using ASTM D5954. These low-level measurements are not amenable to the use of carbon-based sorbent traps which are biased by the presence of organic interferents.

▷ Gas Cylinders

Certain measurement applications may make it impractical or infeasible to sample using sorbent traps. For these applications, a high-pressure gas cylinder filled with the sample gas may be sent to our laboratory for sample processing and analysis via ASTM D5954.

▷ Solids, Slurry, and Sludge

Our Laboratory follows EPA Method 7473 for analysis of solid materials via thermal desorption atomic absorption spectrometry. The types of solid samples our laboratory frequently analyzes for mercury content includes coal, fly ash, soil, sand, limestone, filter materials, and a variety of other materials. We are also equipped to analyze mercury in slurry filtrate and filtride, as well as mercury in sludge.

HCl/HBr Trap Analysis

▷ HCl Analysis

Our Laboratory follows EPA OTM-40 for analysis of hydrogen chloride sorbent traps. Sorbent Traps are analyzed via ion chromatography. These sorbent traps are typically used for measurement of HCl content in coal-fired flue gas prior to a Method 26 or Method 26A compliance test. OTM-40 can also be used in lieu of Method 26 for compliance purposes, following the guidelines described in Alternative Test Method 129.

▷ HBr Analysis

The sorbent traps used for capture and analysis of HCl can also be used for measurement of hydrogen bromide (HBr).

These measurements are typically performed for engineering tests around Air Pollution Control Devices (APCDs). This measurement has been useful for testing native and artificial hydrogen bromide concentrations for the purpose of mercury oxidation.

These sorbent traps are also used to measure inorganic chlorine and fluorine in biogas and RNG.

SO₃/H₂SO₄ Analysis

SO₃ Sorbent Traps are typically used in lieu of Method 8/8A/CTM-013 for engineering studies and process analysis, especially in cases where Method 8 is too difficult to perform at the sampling site. Common applications include measurement of H₂SO₄ emissions from coal-fired power plant stacks, as well as testing of SO₂ → SO₃ conversion across an SCR module or other catalyst. These traps are analyzed via ion chromatography. The laboratory can also perform analysis for Method 8/8A/CTM-013 using either ion chromatography or barium-thorin titration as requested.

NH₃ Analysis

▷ Sorbent Traps for Flue Gas and Stack Emissions

Ammonia sorbent traps are used to measure ammonia slip after SCRs, as well as ammonia concentrations between SCR layers. These sorbent traps are analyzed via ion chromatography following EPA Method 9056A.

▷ Sorbent Traps for Biogas and RNG

Ohio Lumex ammonia sorbent traps for ammonia in biogas and RNG are different from the sorbent traps used for flue gas and stack emissions. This sorbent trap method is based on NIOSH 6016.

Siloxanes Analysis

The laboratory follows ASTM D8230 to perform this analysis. Sorbent traps are the preferred method of capture for siloxanes in biogas and RNG, but we also accept tedlar bags and pressurized cylinders. Our laboratory is capable of modifying this method to analyze siloxanes in materials upon request.

VOCs Analysis

VOCs in gaseous fuels matrices are analyzed by GC-MS. Common VOC analysis typically includes Vinyl Chloride, Methacrolein, Toluene, Ethylbenzene, and 1,4-Dichlorobenzene. Other VOCs and extended TO-15 analysis may be analyzed upon request.

Metals Analysis

▷ Sorbent Traps for Flue Gas and Stack Emissions

Ohio Lumex has developed sorbent trap method OL-21A to function as an alternative to EPA Method 29. This method is currently used to measure arsenic and selenium in various flue gas matrices, and additional metals will be added in the future.

▷ Sorbent Traps for Gaseous Fuels

Ohio Lumex Method OL-21G is used to measure metals in biogas and renewable natural gas. The standard metals analyzed under this method include As, Sb, Cu, and Pb, although other metals may be analyzed upon request.

Major Gas Analysis

The major components in gaseous fuels samples are analyzed via ASTM D1945/D1946 using GC-TCD. Critical characteristics of the gas such as gross heating value, Wobbe Index, compressibility, and ideal relative density are calculated using ASTM D3588.



Upon request, our laboratory may provide a hydrocarbon dewpoint report using the results of the major gas analysis in conjunction with the Peng-Robinson Equation of State.

Speciated and Total Sulfur

Hydrogen sulfide, carbonyl sulfide, mercaptans, and other sulfides in biogas and renewable natural gas are analyzed via ASTM D6228 or ASTM D5504.

Select Halocarbons

Halocarbons are collected and analyzed via EPA TO-14.

SVOCs

Ohio Lumex primarily measures N-nitroso-di-N-propylamine (NDPA) in biogas and RNG using a sorbent trap method analyzed by Modified EPA Method 8270D, although other SVOCs may be analyzed upon request.

PCBs and Organochlorine Pesticides

Ohio Lumex works with a trusted partner to analyze PCBs and Organochlorine pesticides in biogas and RNG using a PUF media trap following EPA TO-10A.

Aldehydes and Ketones

Our laboratory works with a trusted partner to analyze aldehydes and ketones in biogas and RNG using a sorbent trap following EPA TO-11A.

Moisture in Biogas and RNG

Our field services team uses either a chilled mirror (ASTM D1142) or a metal oxide hygrometer (ASTM D5454) to measure the concentration of water in biogas and RNG. This measurement must be performed in the field.

Bacteria (Microbially Influenced Corrosion)

This method utilizes a condensate knockout and filtration method to collect bacterial DNA, which our partner laboratory then analyzes via qPCR. Our standard report includes total bacteria, sulfate-reducing bacteria, acid-producing bacteria, and iron-oxidizing bacteria.

Radiological Analysis

▷ Filterable Radiological Analytes

Gross alpha and beta particles, as well as Pb^{210} in biogas and RNG are captured using a specially designed filter, then analyzed via gamma spectroscopy.

▷ Sorbent Trap for Radon

Rn^{222} in biogas and RNG is captured using a sorbent trap and analyzed via gamma spectroscopy.

The filter and sorbent trap are commonly sampled in series to provide measurements for alpha and beta particles, Pb^{210} , and Rn^{222} in one sample run.

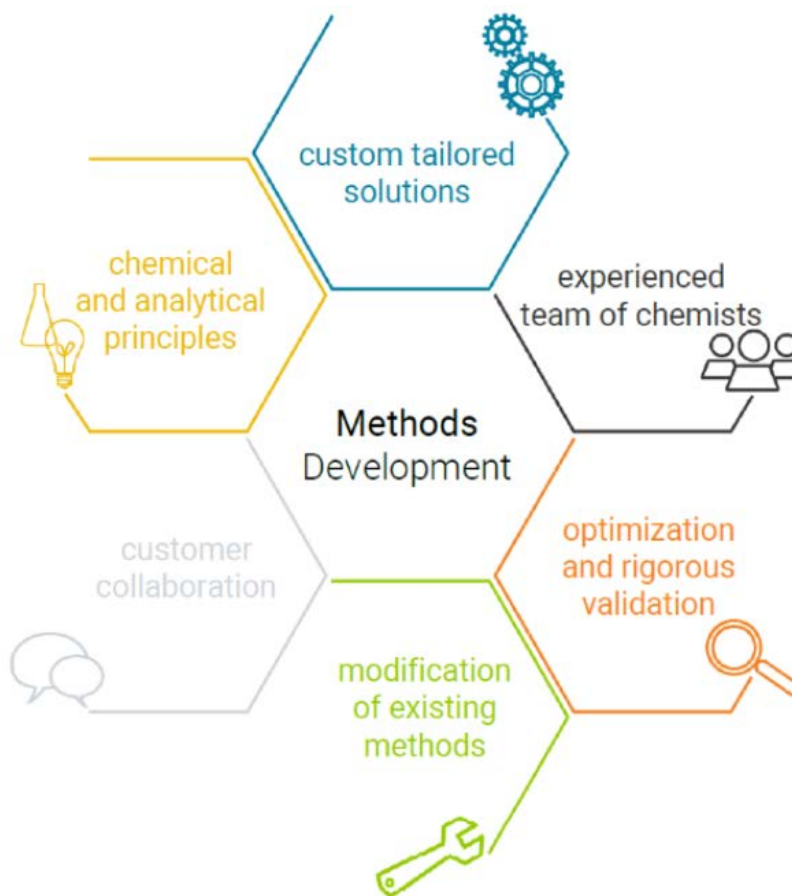
Field Capabilities

When near real-time results are required, the laboratory routinely deploys its analysts, instrumentation, engineers, and sampling equipment in the field.



Methods Development Services

Our chemists go beyond simply knowing how to perform methods by having a deep understanding of chemical and analytical principles which allows the laboratory to develop methods. We have created several in-house methods “from scratch” and modified existing methods which were optimized for specific applications. The laboratory uses technical expertise to modify instrument parameters and components to measure analytes in difficult sample matrices or at extremely low or high concentrations.



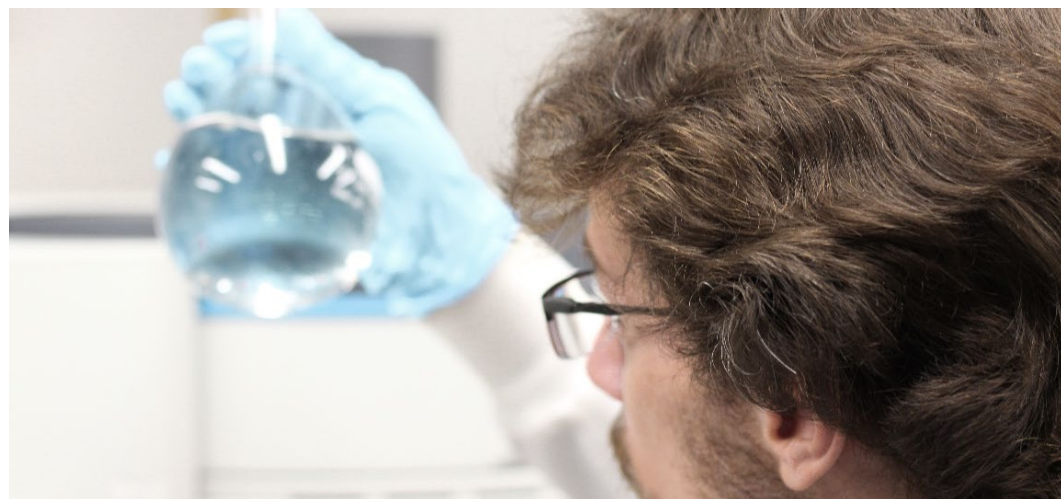


Consulting Services

The Ohio Lumex Laboratory provides consulting and support services in three main areas – Optimization Services, Testing Services, and Training and Support Services. The process begins with an initial consultation to discuss the client's specific needs and concerns, followed by a brief report identifying the pertinent issues and preliminary recommendations. Additional steps may include reviewing existing data, developing a testing program if additional information is required, and training for plant personnel.

- ▶ Optimization Services
- ▶ Testing Services
- ▶ Training & Support Services

The Laboratory will draw on other Ohio Lumex departments, including Engineering, Research & Development, Service, and Field Services, and a team of industry experts, to best serve the specific needs of its clients. Our support team includes individuals who have expertise in a wide range of fields, including plant management, process and chemical engineering, control technologies, risk management, regulatory and compliance, and monitoring and analysis.



A DEDICATED TEAM OF EXPERTS

We have a highly educated, experienced and customer-focused staff dedicated to serving you. Our senior management team provides leadership and direction to our seasoned staff.



Anthony Schneider
M.Sc. in Chemistry

Director of Lab Services
Ohio Lumex Company, Ohio

Anthony has a strong educational background in chemistry. During his years at Ohio Lumex, Anthony has taken on a wide range of responsibilities. Prior to assuming the role of laboratory director, he spent significant time as a field technician and environmental chemist with a focus on method development. He manages several skilled laboratory analysts employed at the Ohio Lumex Analytical Laboratory and also enjoys providing technical support for clients.



Joseph Siperstein
M. Sc. in Physical Chemistry

President and CEO
Ohio Lumex Company, Ohio

Joseph is a chemist, and founder of Ohio Lumex. He has over 40 years of experience in applications related to chemical engineering, design and operation of chemical processes, continuous emissions monitors (CEMs), and analytical instruments, as well as research related to mercury measurement in gas, liquid, and solid media. He is the President of Ohio Lumex Company and has been in the mercury analysis field for over 20 years. He is also the designer of the Ohio Lumex M324 Sorbent Trap Analyzer System and worked with the EPA to validate the Hg sorbent trap methods used today. He continues to facilitate research into new methods and analyzers for alternative testing methods and applications.



Jonathan Cross
M.A. Physics

Director of Technical Services
Ohio Lumex Company, Ohio

Jonathan has managed projects and research and development efforts for Ohio Lumex since 2010. He has been instrumental in the creation of new product lines and analytical methods and has secured support from government research grant programs. He is the author of many Ohio Lumex procedures, including those for sampling and analysis. Jonathan works with the laboratory quality team to ensure the Ohio Lumex laboratory maintains compliance with NELAP standards and the company's internal quality system. He provides technical support for most Ohio Lumex analytical applications.



Shawn Wood

Director of Compliance Technology
Ohio Lumex Company, North Carolina

Shawn brings a wealth of knowledge and experience to the table in regards to mercury species in stack gases and sorbent trap sampling. Before coming to Ohio Lumex, Mr. Wood was Director of Engineering & General Manager at Apex Instruments, where he was responsible for product development of sorbent trap sampling systems. He has also spent more than 20 years testing at over 280 sources, ranging from power plants to cement plants and DOD chemical weapons incineration facilities. Over 90% of all this testing was conducted using Ohio Lumex sorbent traps.