



Since 1982, we've provided laboratory and production equipment to organizations spanning material science and engineering, mechanical and chemical engineering, extraction and processing, biotechnology, heavy industry, education, government, and healthcare.

# THE IMPORTANCE OF HIGH TEMPERATURE CONTROL IN ANODE PRODUCTION USING HIGH-TEMPERATURE (1,900°C) MUFFLE FURNACE

## The Importance of High-Temperature Control in Anode Production with SH Scientific High-Temperature Muffle Furnace

In the world of aluminum manufacturing, the production of anodes is a process that demands rigorous control, particularly over high-temperature conditions. Anodes are indispensable components in the electrolytic production of aluminum, and their quality is a determining factor in both the efficiency and longevity of the production process. Our High-Temperature Muffle Furnace functions as an essential instrument in this area, offering the precision and versatility required to optimize the synthesis of these critical materials.

The anode production process relies on two fundamental materials: calcined petroleum coke and coal tar pitch. Calcined coke is characterized by its high electrical conductivity and mechanical robustness, while coal tar pitch, a material rich in carbon, serves as a binding agent, becoming pliable upon heating. The amalgamation of these materials forms the anodes used in the electrolysis of aluminum.

A critical phase in anode production is the calcining of petroleum coke and coal tar pitch, a process that occurs at elevated temperatures. The properties of the final anodes—such as their structural integrity and electrochemical performance—are profoundly influenced by the temperature control during this phase. Precise temperature regulation is not merely a procedural requirement but a cornerstone of quality anode production.

Calcining these carbonaceous materials involves subjecting them to temperatures that can exceed 1200°C. This thermal treatment is vital for eliminating volatile compounds, augmenting the carbon content, and achieving the desired crystalline structure. Any deviation from the optimal temperature can lead to suboptimal anode properties, which may compromise the efficiency of the aluminum production process.

Our High-Temperature Muffle Furnace is engineered to deliver the exacting temperature control necessary for this critical operation. With maximum temperatures ranging from 1,050°C to 1,900°C and chamber volumes from 3 to 36 liters, these furnaces offer a cost-effective yet uncompromising solution for various laboratory needs.

The inclusion of programmable controllers in the MH and MS series—and as an option for the MG series—allows for precise thermal profiling, essential for research and industrial applications. Compatibility with ball-type gas flow meters further enhances the furnace's adaptability, enabling controlled atmospheres within the chamber.

What sets this furnace apart is not only its precision and uniform heat distribution but also its adaptability to various process requirements. Recognizing the diverse needs of research and industrial applications, SH Scientific has introduced several optional features in 2024:

- Testo 300 Combustion Gas Analyzer: This device facilitates monitoring of oxygen-free atmospheres inside the chamber or tube and measures combustion gas and synthetic gas components, ensuring optimal conditions during calcining.
- Laboratory Gas-Drying Unit by Drierite™: Equipped with connectors, this unit aids in maintaining the desired humidity levels within the furnace, crucial for processes sensitive to moisture.
- Quartz Shelf: Designed to maximize available space in the chamber, the quartz shelf allows for efficient arrangement of samples, enhancing throughput.
- Digital Vacuum Precision Meter by DigiVac:
  - This instrument provides accurate measurements of vacuum levels, essential for processes requiring low-pressure environments.

To summarize these capabilities, the following table provides a detailed overview of the SH Scientific High-Temperature Muffle Furnace's features and their benefits in the context of anode production:

Feature	Description	Benefit for Anode Production
Temperature Range	1,050°C to 1,900°C	Suitable for both low-temperature processes and high-temperature calcining, ensuring versatility.
Chamber Volume	3L to 36L	Flexible capacity to accommodate various research and industrial scales.
Temperature Stability	±1°C	Maintains precise temperature control, crucial for optimizing anode properties.
Uniform Heat Distribution	Advanced chamber design ensures even heating throughout the furnace.	Prevents inconsistencies in anode material properties.
Programmable Controllers	Included with MH and MS series; optional for MG series (MGE series do not support).	Allows precise thermal profiling and automated processes.
Optional Gas Module	Compatible with ball-type gas flow meters; supports inert atmospheres like nitrogen or argon.	Prevents oxidation and other unwanted reactions during calcining.
Optional Vacuum Capability	Enhanced by Digital Vacuum Precision Meter by DigiVac.	Further enhances material purity and quality by eliminating contaminants.
Heating Rate	Up to 20°C per minute	Fast heating reduces processing time, increasing lab efficiency.
Energy Efficiency	High-efficiency insulation and heating elements.	Reduces operational costs and supports sustainability initiatives.
Data Logging and Control Interface	Integrated with advanced digital controls and data logging.	Allows precise monitoring and adjustments, crucial for research accuracy.
Testo 300 Combustion Gas Analyzer (Optional)	Monitors oxygen-free atmosphere and measures combustion/synthetic gas components.	Ensures optimal atmospheric conditions during calcining.
Laboratory Gas-Drying Unit by Drierite™ (Optional)	Maintains desired humidity levels within the furnace.	Crucial for moisture-sensitive processes.
Quartz Shelf (Optional)	Maximizes available space in the chamber.	Enhances sample arrangement and throughput.

In the highly specialized field of aluminum production, where the quality of anodes can significantly influence both operational efficiency and cost-effectiveness, the SH Scientific High-Temperature Muffle Furnace provides a solution that meets the most stringent standards.

By offering precise temperature control, uniform heating, and a suite of customizable options—including the latest enhancements for 2024—this furnace plays an indispensable role in optimizing the properties of calcined petroleum coke and coal tar pitch.

Consequently, it supports the production of superior anodes and contributes to more efficient and sustainable aluminum manufacturing practices.

Choosing the right equipment is crucial for the success of your research. SH Scientific's high temperature muffle furnace, with its advanced features and customizable options, is designed to meet the most demanding laboratory requirements. We encourage you to contact us to discuss your needs or to place an order. Our team is ready to provide the support and expertise you need to make an informed decision. Get in touch with SH Scientific and invest in the future of your research.



## A BRIEF HISTORY OF SH SCIENTIFIC



### Call Us

+1 503-850-8670



### Email

[jbang@labandfurnace.com](mailto:jbang@labandfurnace.com)



### U.S. Headquarter

12725 SW Millikan Way  
Beaverton, OR 97005

## Serving North America Since 2013

In 2018, after particularly rapid growth in the American education and public sectors, we founded a US head office in Portland, Oregon. Whether you're visiting us on behalf of a major institution, a small lab, or anything in between, we're honored that you're considering SH Scientific as a potential partner. We look forward to a lasting relationship in support of your innovation and discovery.

