



Comprehensive Solution Provider for Advanced Sintering & Special Bonding Technologies and Equipment.

先进烧结&特种连接技术及装备 综合解决方案服务商

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HY-2026-CⅢ版

COMPANY PROFILE

关于皓越 >>>



江苏皓越真空设备有限公司是一家专注于先进材料烧结与特种材料连接技术及装备的综合解决方案服务商，集研发、生产、销售与服务于一体，是国家高新技术企业、专精特新企业。

目前，公司拥有15000m²现代化厂房和先进加工设备，建立了严格的质量管理体系，确保产品制造精度和质量达到行业先进水平。公司研发团队由行业精英组成，已获70余项专利及软件著作权，可为客户提供多元化、高效可靠的烧结、热处理与特种连接装备及工艺解决方案。公司产品覆盖真空钎焊炉、真空扩散焊接系统、真空退火炉、SPS、真空热压炉、气压烧结炉、真空烧结炉、氢气炉等核心设备，重点服务航空航天与燃气轮机，半导体与电子信息材料，先进陶瓷与超硬材料，硬质合金、粉末冶金与难熔金属，新能源、氢能及核能，增材制造与高端铸造，以及高端连接、换热与热管理七大核心行业，为高端材料制造和关键部件可靠成形提供坚实的技术支撑与设备保障。

凭借强大的生产能力、稳定的产品质量和快速响应、专业解决、全程负责、持续增值的服务理念，公司业务已遍布全球多个国家和地区，成为国际市场上具有竞争力的烧结及特种连接装备供应商。同时，公司设有超过500m²的设备展厅和3000m²先进材料烧结研发中心实验室，可围绕增材制造后处理、先进陶瓷烧结、粉末冶金近净成形、高端连接与热管理等方向，为公司及外部合作伙伴提供先进的科研、验证与实验平台。

展望未来，皓越真空将以“让先进材料更易制造，让关键连接更加可靠”为品牌主张，秉承“以先进装备和工艺创新，帮助客户实现高端材料与关键部件的可靠制造”的企业使命，坚持客户成功、技术创新、质量为本、诚信担当、协同共创、长期主义的核心价值观，弘扬求真、创新、精工、担当的企业精神，践行聚焦高端、技术驱动、客户成功、合作共赢、长期发展的经营理念，尊重人才、以奋斗者为本，让贡献者共享发展成果，致力于成为全球领先的先进烧结与特种连接技术及装备企业，推动高端材料制造持续进步。

Jiangsu Haoyue Technology Co., Ltd. is a comprehensive solution provider focusing on technologies and equipment for advanced material sintering and special material bonding. Integrating R&D, production, sales and services, the company holds the qualifications of National High-tech Enterprise and Specialized, Refined, Unique & Innovative Enterprise.

The company owns a modern plant covering 15,000 m² equipped with advanced processing machinery. A rigorous quality management system has been established to ensure the manufacturing precision and quality of products reach advanced industry standards. Our R&D team consists of industry specialists. With more than 70 patents and software copyrights granted, we are capable of delivering diversified, efficient and reliable equipment as well as process solutions for sintering, heat treatment and special material bonding. Our core product portfolio includes vacuum brazing furnaces, vacuum diffusion bonding systems, vacuum annealing furnaces, Spark Plasma Sintering (SPS) equipment, vacuum hot pressing furnaces, gas pressure sintering furnaces, vacuum sintering furnaces, hydrogen furnaces and more. Our key served industries cover seven major sectors: aerospace & gas turbines; semiconductors and electronic information materials; advanced ceramics and superhard materials; cemented carbides, powder metallurgy and refractory metals; new energy, hydrogen energy and nuclear energy; additive manufacturing and high-end casting; high-end bonding, heat exchange and thermal management. We deliver robust technical support and equipment assurance for the manufacturing of advanced materials and reliable forming of critical components.

Backed by strong manufacturing capacity, consistent product quality, as well as the service philosophy of rapid response, professional troubleshooting, full-cycle accountability and sustained value creation, our business footprint spans numerous countries and regions worldwide, establishing us as a competitive supplier of sintering and special material bonding equipment on the global market. Meanwhile, the company operates an equipment exhibition hall of over 500 m² and an advanced material sintering R&D laboratory of 3,000 m². Centered on post-processing for additive manufacturing, advanced ceramic sintering, near-net shaping in powder metallurgy, high-end bonding and thermal management, the platform provides sophisticated scientific research, verification and testing services for internal teams and external partners.

Looking ahead, Haoyue Vacuum adheres to the brand proposition: Making advanced materials easier to manufacture; enabling more reliable critical bonds. Guided by our corporate mission — to help customers realize reliable manufacturing of high-end materials and key components through innovative advanced equipment and processes, we uphold our core values: customer success, technological innovation, quality priority, integrity and accountability, collaborative co-creation and long-term thinking. We promote the enterprise spirit of truth-seeking, innovation, precision craftsmanship and responsibility, and practice our business philosophy of focusing on high-end markets, technology-driven development, customer success, win-win cooperation and sustainable growth. We respect talents, prioritize strivers, and ensure contributors share the fruits of development. We strive to become a world-leading enterprise in advanced sintering and special material bonding technologies and equipment, and continuously drive the advancement of high-end material manufacturing.

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SPS放电等离子烧结系统

Spark Plasma Sintering (SPS) System

S Series



升温速度快 / 烧结时间短 / 组织结构可控 / 节能环保

Fast Heating Rate / Short Sintering Time / Controllable Organizational Structure /
Energy-saving and Environmental Protection

简介 / INTRODUCTION

SPS(Spark Plasma Sintering)放电等离子烧结系统是当今世界上最先进的烧结系统之一，是在两电极间施加脉冲电流和轴向压力进行粉末烧结致密化的一种新型快速烧结技术。它具有升温速度快、烧结时间短、组织结构可控、节能环保等鲜明特点，可用来制备金属材料、陶瓷材料、复合材料，也可用来制备纳米块体材料、非晶块体材料、梯度材料等。

The SPS (Spark Plasma Sintering) discharge plasma sintering system is one of the most advanced sintering systems in the world today. It is a new rapid sintering technology that applies pulsed current and axial pressure between two electrodes to achieve powder sintering and densification. It possesses distinct characteristics including fast heating rate, short sintering time, controllable organizational structure, and energy conservation with environmental protection. The system can be used to prepare metal materials, ceramic materials, and composite materials, as well as nano bulk materials, amorphous bulk materials, and gradient materials.

S-400等轴测图

S-400 Isometric View



技术特点 / ADVANTAGES

由于SPS过程中施加直流脉冲电流产生放电效应而带来的一些特有现象，有以下几个特点：

- 可以快速升温，快速冷却，大幅缩短生产时间，降低生产成本（升温速率可达300°C/min）；
- 烧结温度低（与热压烧结相比，烧结温度可进一步降低）；
- 具有独特的净化、活化效应（消除粉末颗粒表面吸附气体，击穿氧化膜），轻松实现难烧结材料、多元素材料的烧结；
- 相比于传统烧结工艺，可以在更短的时间内得到组织性质更均匀、更致密、晶粒尺寸更小的材料；
- 相比于传统烧结工艺，可大幅节省电能；
- 采用我司专业直流脉冲电源技术，具有烧结速度快、稳定可靠，节能效果好；
- 压力精度高：采用伺服压力控制系统，压力精度为±3%；
- 采用双温度传感器测温，低温段采用K型热电偶控温，高温段采用红外控温；
- 安全性好：采用工控机+PLC+PID压力传感控制，安全可靠；
- 密封性能好：动态压头均采用波纹管密封，确保不漏气。

Due to the discharge effect caused by the application of DC pulse current during the spark plasma sintering (SPS) process, there are several unique characteristics:

- It can quickly heat up and cool down, significantly shortening production time and reducing production costs (with a heating rate of up to 300°C/min).
- Lower sintering temperature (compared to hot pressing sintering, the sintering temperature can be further reduced).
- Unique purification and activation effect (eliminating the adsorption of gas on the surface of powder particles and breaking through the oxide film), easily achieving the sintering of difficult-to-sinter materials and multi-element materials.
- Compared to traditional sintering processes, materials with more uniform microstructure, greater density, and smaller grain sizes can be obtained in a shorter time.
- Compared to traditional sintering processes, it can significantly save electrical energy.
- Adopting our professional DC pulse power supply technology, featuring fast sintering speed, stable and reliable performance, and excellent energy-saving effect.
- **High Pressure Accuracy:** Adopting a servo pressure control system, with pressure accuracy of ±3%.
- Using dual temperature sensors for temperature measurement—K-type thermocouple for temperature control in the low-temperature range and infrared temperature control in the high-temperature range.
- **Excellent Safety Performance:** Adopting industrial control computer + PLC + PID pressure sensing control, safe and reliable.
- **Superior Sealing Performance:** Dynamic pressure heads sealed with corrugated pipe to ensure no air leakage.

产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	样品直径(mm) Sample Dia. (mm)	压力(T) Pressure (ton)	电压(V) Voltage (V)	电流(A) Current (A)	加热功率(kW) Heating Power (kW)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)
S4	Φ80-120	50	10	20000	200	1	2200
S-150	Φ100-150	100	10	30000	300	1	2200
S-200	Φ150-200	200	10	50000	400	1	2200
S-300	Φ200-300	300	10	60000	600	1	2200
S-400	Φ300-400	400	10	80000	800	1	2200

应用领域 / APPLICATIONS

- 金属：Fe、Cu、Al、Au、Ag、Ni、Cr、Mo、Sn、Ti、W、Be；
- 陶瓷氧化物：Al₂O₃、Mulitex ZrO₂、Mg、SiO₂、TiO₂、HfO₂；
- 碳化物：SiC、B₄C、TaC、WC、ZrC、VC；
- 氮化物：Si₃N₄、TaN、TiN、AlN、ZrN、VN；
- 硼化物：TiB₂、HfB₂、LaB₆、ZrB₂、VB₂；
- 氟化物：LiF、CaF₂、MgF₂；
- 金属陶瓷：Si₃N₄+Ni、Al₂O₃+Ni、ZrO₂+Ni、Al₂O₃+Ti、SUS+WC/Co、BN+Fe、WC+Co+Fe；
- 金属化合物：TiAl、MoSi₂、Si₃Zr₅、NiAl、NbCo、NbAl、Sm₂Co₁₇。
- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
- Ceramic Oxides: Al₂O₃, Mulitex ZrO₂, Mg, SiO₂, TiO₂, HfO₂.
- Carbides: SiC, B₄C, TaC, WC, ZrC, VC.
- Nitrides: Si₃N₄, TaN, TiN, AlN, ZrN, VN.
- Boride: TiB₂, HfB₂, LaB₆, ZrB₂, VB₂.
- Fluorides: LiF, CaF₂, MgF₂.
- Metal Ceramics: Si₃N₄+Ni, Al₂O₃+Ni, ZrO₂+Ni, Al₂O₃+Ti, SUS+WC/Co, BN+Fe, WC+Co+Fe.
- Metal Compounds: TiAl, MoSi₂, Si₃Zr₅, NiAl, NbCo, NbAl, Sm₂Co₁₇.

S4等轴测图

S4 Isometric View



SPS放电等离子混合烧结系统

Hybrid Spark Plasma Sintering (SPS + Induction) System

S Series



温度均匀性好 / 升温速度快 / 烧结时间短 /
组织结构可控 / 节能环保

Good Temperature Uniformity / Fast Heating Rate /
Short Sintering Time / Controllable Organizational Structure /
Energy-saving and Environmental Protection

S-400D等轴测图

S-400D Isometric View



简介 / INTRODUCTION

SPS (Spark Plasma Sintering) 放电等离子烧结系统是当今世界上最先进的烧结系统之一，是在两电极间施加脉冲电流和轴向压力进行粉末烧结致密化的一种新型快速烧结技术。同时增加感应加热作为辅助加热，它具有温度均匀性好、升温速度快、烧结时间短、组织结构可控、节能环保等鲜明特点，可用于制备金属材料、陶瓷材料、复合材料，也可用来制备纳米块体材料、非晶块体材料、梯度材料等。

SPS (Spark Plasma Sintering) discharge plasma sintering system is one of the most advanced sintering systems in the world today. It is a new rapid sintering technology that applies pulsed current and axial pressure between two electrodes to achieve powder densification. The system incorporates induction heating as supplementary heating and features excellent temperature uniformity, rapid heating rate, short sintering time, controllable microstructure, and notable energy conservation and environmental protection characteristics. It can be used to prepare metal materials, ceramic materials, composite materials, as well as nano bulk materials, amorphous bulk materials, gradient materials, and more.

技术特点 / ADVANTAGES

- 相比于单纯的SPS烧结，增加了感应加热热场，热场温度更加均匀，材料中心和边沿温差缩小，可烧结更大尺寸的产品；
- 生产用的大型SPS系统。充分考量了烧结工艺的自动化和操作性，烧结温度，加压控制，电流控制等自动程控系统为设备的标准配置；
- 配备数据采集解析系统，可将决定烧结体产品品质的工艺参数，如烧结电压、电流、控制温度、施加压力、位移、真空度、位移变化率、实测温度等物理量进行保存和调用，以对产品生产工艺进行追踪；
- 设备采用了自主开发的脉冲DC电源，与传统的同等级别SPS相比，耗电量大幅降低，可真正有效地实现节能降耗环保型高品位的烧结生产。
- Compared to pure SPS sintering, the addition of induction heating thermal field results in more uniform thermal field temperature and reduced temperature difference between the center and edge of material, enabling sintering of larger sized products.
- Large-scale production SPS systems with full consideration for automation and controllability of the sintering process; automatic program control systems for sintering temperature, pressure control, and current control are standard equipment configuration.
- Equipped with data collection and analysis system capable of recording and retrieving physical process parameters that determine sintered product quality, including sintering voltage, current, control temperature, applied pressure, displacement, vacuum degree, displacement change rate, and measured temperature for tracking product production processes.
- Equipment employs self-developed pulsed DC power supply which significantly reduces power consumption compared to traditional equivalent-level SPS systems, truly and effectively achieving energy-saving, consumption-reducing, and environmentally friendly high-grade sintering production.

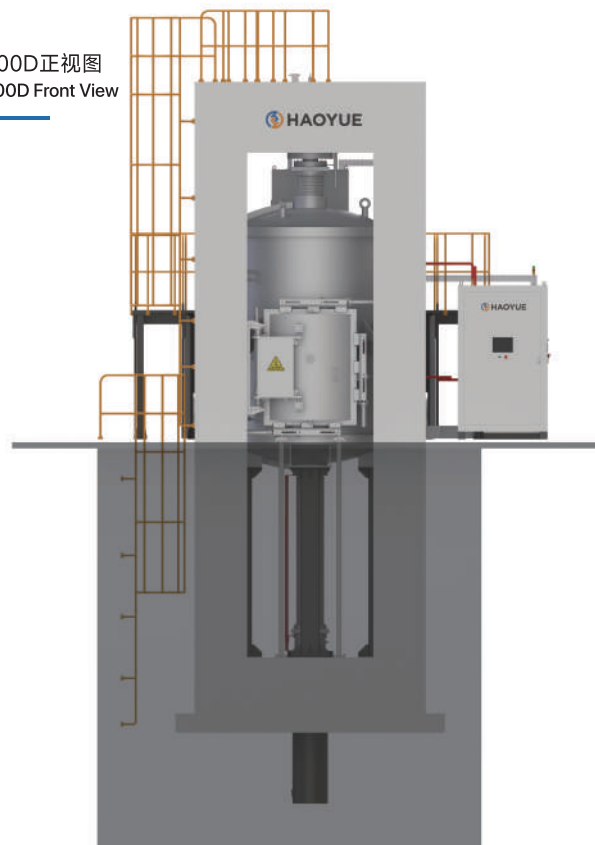
产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	样品直径(mm) Sample Dia. (mm)	机械压力(T) Mechanical Pressure (ton)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)
S-200D	Φ350×600	Φ200	200	5	2200
S-300D	Φ400×800	Φ300	300	5	2200
S-400D	Φ600×800	Φ400	400	5	2200

应用领域 / APPLICATIONS

- 金属: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be;
- 陶瓷氧化物: Al_2O_3 , Mulitex ZrO_2 , Mg, SiO_2 , TiO_2 , HfO_2 ;
- 碳化物: SiC , B_4C , TaC, WC, ZrC, VC;
- 氮化物: Si_3N_4 , TaN, TiN, AlN, ZrN, VN;
- 硼化物: TiB_2 , HfB_2 , LaB_6 , ZrB_2 , VB_2 ;
- 氟化物: LiF, CaF_2 , MgF_2 ;
- 金属陶瓷: Si_3N_4+Ni , Al_2O_3+Ni , ZrO_2+Ni , Al_2O_3+Ti , SUS+WC/Co, BN+Fe, WC+Co+Fe;
- 金属化合物: TiAl, MoSi₂, Si_3Zr_5 , NiAl, NbCo, NbAl, Sm_2Co_{17} .
- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
- Ceramic Oxides: Al_2O_3 , Mulitex ZrO_2 , Mg, SiO_2 , TiO_2 , HfO_2 .
- Carbides: SiC , B_4C , TaC, WC, ZrC, VC.
- Nitrides: Si_3N_4 , TaN, TiN, AlN, ZrN, VN.
- Boride: TiB_2 , HfB_2 , LaB_6 , ZrB_2 , VB_2 .
- Fluorides: LiF, CaF_2 , MgF_2 .
- Metal Ceramics: Si_3N_4+Ni , Al_2O_3+Ni , ZrO_2+Ni , Al_2O_3+Ti , SUS+WC/Co, BN+Fe, WC+Co+Fe.
- Metal Compounds: TiAl, MoSi₂, Si_3Zr_5 , NiAl, NbCo, NbAl, Sm_2Co_{17} .

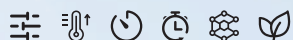
S-400D正视图
S-400D Front View



SPS半连续式等离子 烧结系统

Semi-continuous Spark Plasma Sintering (SPS) system

S Series



温度均匀性好 / 升温速度快 / 烧结时间短 / 生产效率高 /
组织结构可控 / 节能环保

Good Temperature Uniformity / Fast Heating Rate / Short Sintering Time /
High Production Efficiency / Controllable Organizational Structure /
Energy-saving and Environmental Protection

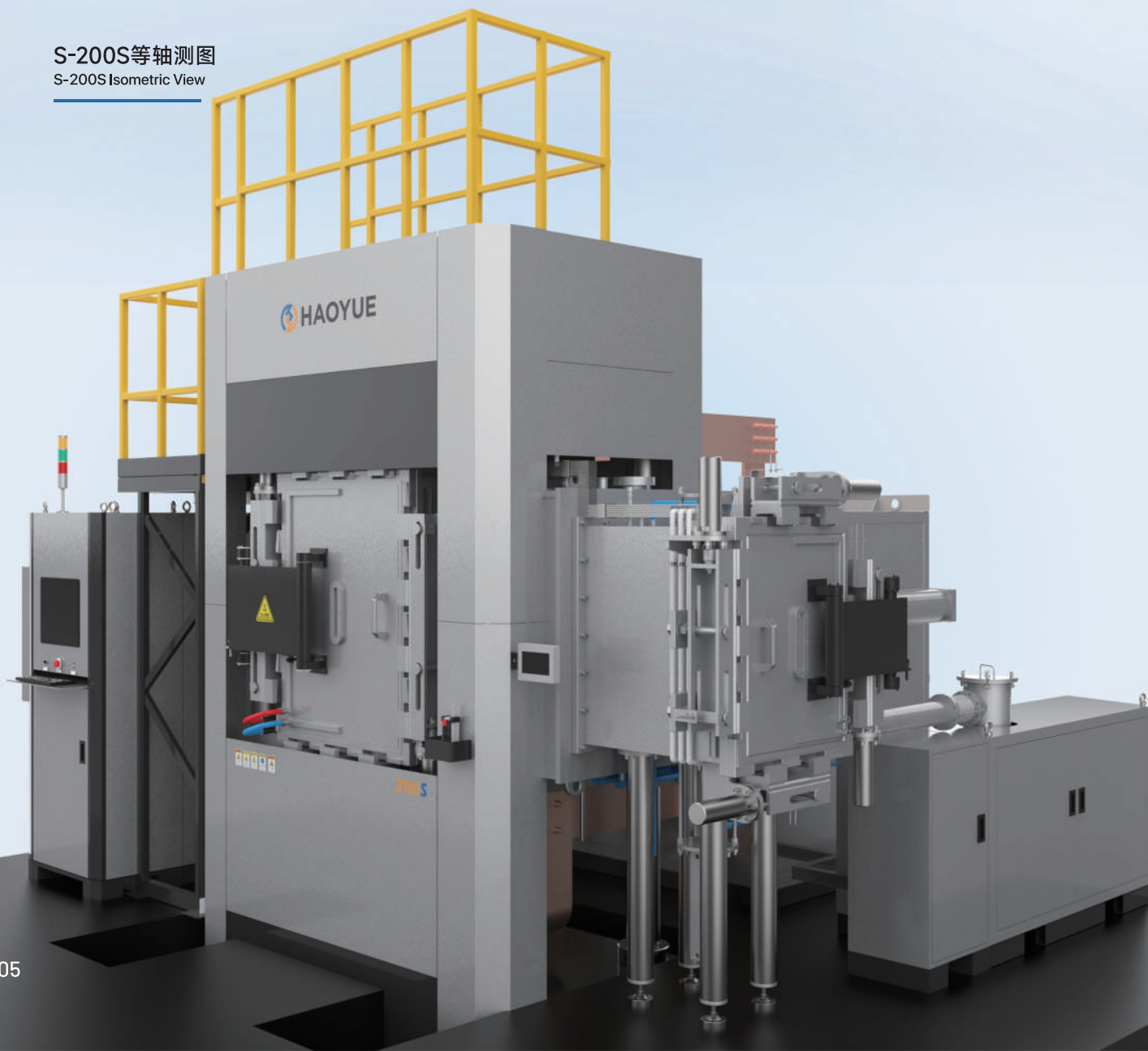
简介 / INTRODUCTION

SPS(Spark Plasma Sintering)放电等离子烧结系统是当今世界上最先进的烧结系统之一，是在两电极间施加脉冲电流和轴向压力进行粉末烧结致密化的一种新型快速烧结技术。它具有升温速度快、烧结时间短、组织结构可控、节能环保等鲜明特点，可用来制备金属材料、陶瓷材料、复合材料，也可用来制备纳米块体材料、非晶块体材料、梯度材料等。半连续式成产，可增加生产效率。

The SPS (Spark Plasma Sintering) discharge plasma sintering system is one of the most advanced sintering systems in the world today. It is a new rapid sintering technology that applies pulsed current and axial pressure between two electrodes to achieve powder sintering and densification. It possesses distinct characteristics including fast heating rate, short sintering time, controllable organizational structure, and energy conservation with environmental protection. The system can be used to prepare metal materials, ceramic materials, and composite materials, as well as nano bulk materials, amorphous bulk materials, and gradient materials.

S-200S等轴测图

S-200S Isometric View



技术特点 / ADVANTAGES

由于SPS过程中施加直流脉冲电流产生放电效应而带来的一些特有现象，有以下几个特点：

- 半连续式设计：设计为加热室和冷却室共2个腔室，较连续式SPS可减少设备成本，可使得效率增加，产量提升。
- 可以快速升温，快速冷却，大幅缩短生产时间，降低生产成本(升温速率可达300°C/min)；
- 具有独特的净化、活化效应(消除粉末颗粒表面吸附气体，击穿氧化膜)，轻松实现难烧结材料、多元素材料的烧结；
- 相比于传统烧结工艺，可以在更短的时间内得到组织性质更均匀、更致密、晶粒尺寸更小的材料；
- 相比于传统烧结工艺，可大幅节省电能；
- 采用我司专业直流脉冲电源技术，具有烧结速度快、稳定可靠，节能效果好；
- 压力精度高：采用伺服压力控制系统，压力精度为 $\pm 3\%$ ；
- 采用双红外测温，一红外控温，另一个红外测温或校准温度；
- 安全性能好：采用工控机+PLC+PID压力传感控制，安全可靠；
- 密封性能好：动态压头均采用波纹管密封，确保不漏气。

Due to the discharge effects produced by DC pulse current application during the SPS (spark plasma sintering) process, the following distinctive characteristics are present:

- **Semi-continuous Design:** Configured with two chambers—one for heating and one for cooling. Compared to continuous SPS systems, this reduces equipment costs while increasing efficiency and production output.
- **Rapid Heating and Cooling:** Significantly shortens production time and reduces production costs. Heating rate reaches up to 300°C/min.
- **Unique Purification and Activation Effects:** Eliminates gas adsorption on powder particle surfaces and breaks through oxide films, enabling easy sintering of difficult-to-sinter and multi-element materials.
- **Superior Microstructure:** Compared to conventional sintering processes, materials achieve more uniform grain structure, greater density, and finer grain size in shorter processing times.
- **Significant Energy Savings:** Substantially reduces electrical energy consumption versus traditional sintering methods.
- **Professional DC Pulse Power Supply Technology:** Delivers fast sintering speed, stable and reliable performance, and excellent energy efficiency.
- **High Pressure Accuracy:** Employs servo pressure control system with pressure accuracy of $\pm 3\%$.
- **Dual Infrared Temperature Measurement:** One infrared sensor for temperature control; the second for temperature measurement and calibration verification.
- **Excellent Safety Performance:** Utilizes industrial PC + PLC + PID pressure sensor control for safe and reliable operation.
- **Superior Sealing Performance:** Dynamic pressure heads sealed with corrugated bellows ensure zero gas leakage.

应用领域 / APPLICATIONS

- 金属：Fe、Cu、Al、Au、Ag、Ni、Cr、Mo、Sn、Ti、W、Be；
 - 陶瓷氧化物：Al₂O₃、Mulitex ZrO₂、Mg、SiO₂、TiO₂、HfO₂；
 - 碳化物：SiC、B₄C、TaC、WC、ZrC、VC；
 - 氮化物：Si₃N₄、TaN、TiN、AlN、ZrN、VN；
 - 硼化物：TiB₂、HfB₂、LaB₆、ZrB₂、VB₂；
 - 氟化物：LiF、CaF₂、MgF₂；
 - 金属陶瓷：Si₃N₄+Ni、Al₂O₃+Ni、ZrO₂+Ni、Al₂O₃+Ti、SUS+WC/Co、BN+Fe、WC+Co+Fe；
 - 金属化合物：TiAl、MoSi₂、Si₃Zr₅、NiAl、NbCo、NbAl、Sm₂Co₁₇。
-
- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
 - Ceramic Oxides: Al₂O₃, Mulitex ZrO₂, Mg, SiO₂, TiO₂, HfO₂.
 - Carbides: SiC, B₄C, TaC, WC, ZrC, VC.
 - Nitrides: Si₃N₄, TaN, TiN, AlN, ZrN, VN.
 - Boride: TiB₂, HfB₂, LaB₆, ZrB₂, VB₂.
 - Fluorides: LiF, CaF₂, MgF₂.
 - Metal Ceramics: Si₃N₄+Ni, Al₂O₃+Ni, ZrO₂+Ni, Al₂O₃+Ti, SUS+WC/Co, BN+Fe, WC+Co+Fe.
 - Metal Compounds: TiAl, MoSi₂, Si₃Zr₅, NiAl, NbCo, NbAl, Sm₂Co₁₇.

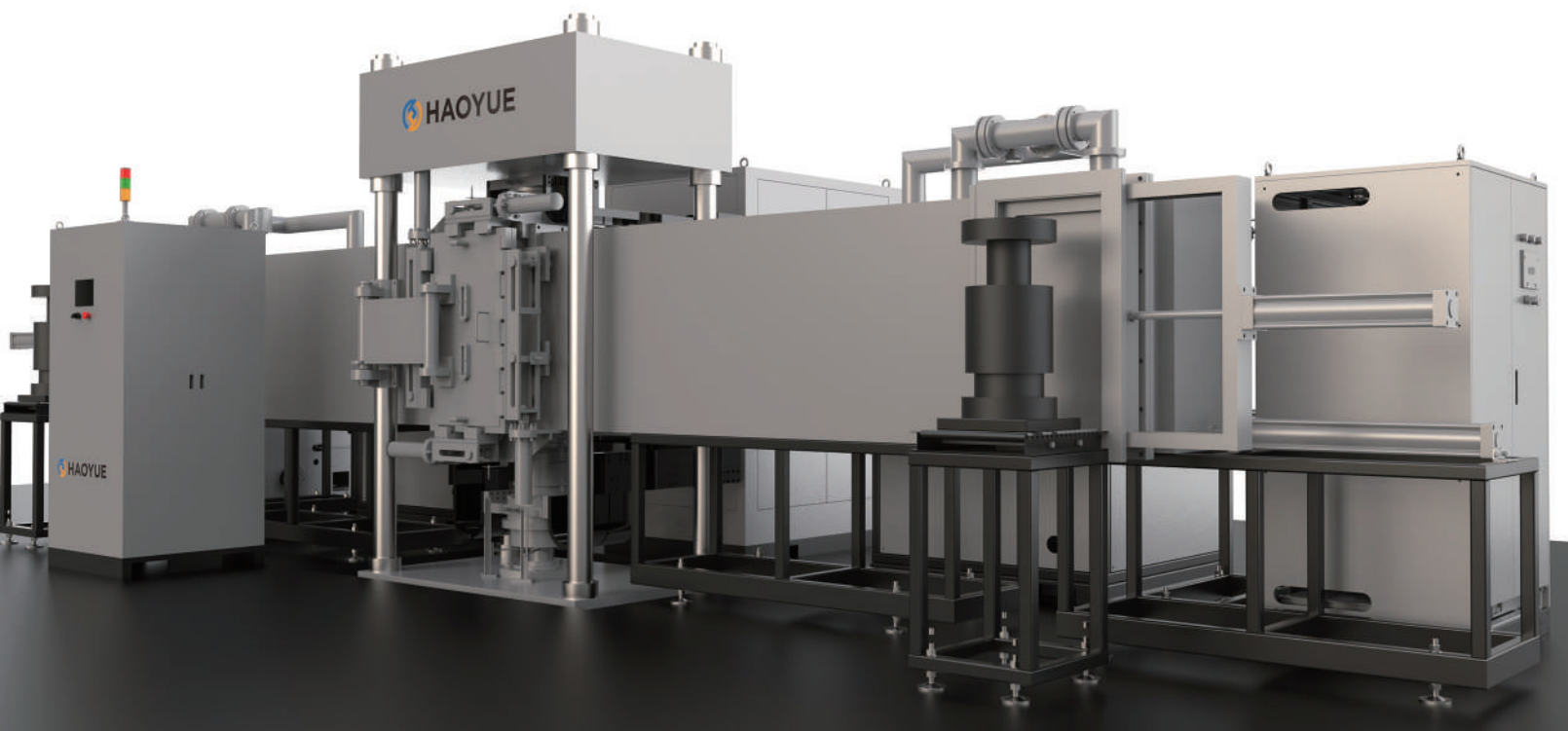
S-200S等轴测图
S-200S Isometric View



产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	样品直径(mm) Sample Dia. (mm)	机械压力(T) Mechanical Pressure (ton)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)
S-150S	半连续式(双室) Semi-continuous (Two chambers)	Φ150	100	10	2200
S-200S	半连续式(双室) Semi-continuous (Two chambers)	Φ200	200	10	2200

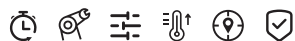
S-150C等轴测图
S-150C Isometric View



SPS连续式放电等离子 烧结系统

Continuous Spark Plasma Sintering (SPS) System

S Series



生产效率 / 自动化程序 / 温度均匀性好 / 升温速度快 /
压力精度高 / 安全性能好

High Production Efficiency / High Automation Level /
Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance

简介 / INTRODUCTION

SPS(Spark Plasma Sintering)放电等离子烧结系统是当今世界上最先进的烧结系统之一，是在两电极间施加脉冲电流和轴向压力进行粉末烧结致密化的一种新型快速烧结技术。它具有升温速度快、烧结时间短、组织结构可控、节能环保等鲜明特点，可用于制备金属材料、陶瓷材料、复合材料，也可用来制备纳米块体材料、非晶块体材料、梯度材料等。

The SPS (Spark Plasma Sintering) discharge plasma sintering system is one of the most advanced sintering systems in the world today. It is a new rapid sintering technology that applies pulsed current and axial pressure between two electrodes for powder sintering densification. It has distinctive characteristics such as fast heating rate, short sintering time, controllable microstructure, energy conservation, and environmental protection. It can be used to prepare metal materials, ceramic materials, composite materials, as well as nano bulk materials, amorphous bulk materials, gradient materials, and similar advanced engineered materials.

技术特点 / ADVANTAGES

由于SPS过程中施加直流脉冲电流产生放电效应而带来的一些特有现象，有以下几个特点：

- 采用多工位设计，可以连续生产，使得效率倍增。
- 可以快速升温，快速冷却，大幅缩短生产时间，降低生产成本(升温速率可达200°C/min)；
- 相比于传统烧结工艺，可以在更短的时间内得到组织性质更均匀、更致密、晶粒尺寸更小的材料；
- 无需粉末预成型，可以直接烧结成致密体；
- 采用我司专业直流脉冲电源技术，具有烧结速度快、稳定可靠，节能效果好；
- 压力精度高：采用伺服压力控制系统，压力精度为±3%；
- 自动化程度高：如选装自动装卸料系统，将可完成所有工序全自动运行，数字化、智能化、无需人工干预；
- 安全性性能好：采用工控机+PLC+PID压力传感控制，安全可靠；
- 密封性能好：动态压头均采用波纹管密封，确保不漏气。

Due to the discharge effect caused by the application of DC pulse current during the SPS process, the following unique characteristics are observed:

- **Multi-station Design:** Continuous production capability, resulting in significantly increased efficiency.
- **Rapid Heating and Cooling:** Quick temperature rise and cool-down enable dramatically shortened production times and reduced production costs (heating rate up to 200°C/min).
- **Superior Material Properties:** Compared to traditional sintering processes, materials with more uniform microstructure, greater density, and smaller grain sizes are obtained in significantly shorter processing times.
- **No Powder Preforming Required:** Powder can be directly sintered to full density without prior compaction.
- **Professional DC Pulse Power Supply Technology:** Provides fast sintering speed, stable and reliable operation, and excellent energy-saving performance.
- **High Pressure Accuracy:** Servo pressure control system delivers pressure accuracy of ±3%.
- **High Degree of Automation:** Optional automatic loading and unloading system enables fully automated operation of all processes with digital and intelligent control, requiring no manual intervention.
- **Excellent Safety Performance:** Equipped with IPC+PLC+PID pressure sensor control for safe and reliable operation.
- **Superior Sealing Performance:** Dynamic pressure heads employ corrugated pipe seals to ensure completely leak-free operation.

应用领域 / APPLICATIONS

- 金属：Fe、Cu、Al、Au、Ag、Ni、Cr、Mo、Sn、Ti、W、Be；
- 陶瓷氧化物：Al₂O₃、Mulitex ZrO₂、Mg、SiO₂、TiO₂、HfO₂；
- 碳化物：SiC、B₄C、TaC、WC、ZrC、VC；
- 氮化物：Si₃N₄、TaN、TiN、AlN、ZrN、VN；
- 硼化物：TiB₂、HfB₂、LaB₆、ZrB₂、VB₂；
- 氟化物：LiF、CaF₂、MgF₂；
- 金属陶瓷：Si₃N₄+Ni、Al₂O₃+Ni、ZrO₂+Ni、Al₂O₃+Ti、SUS+WC/Co、BN+Fe、WC+Co+Fe；
- 金属化合物：TiAl、MoSi₂、Si₃Zr₅、NiAl、NbCo、NbAl、Sm₂Co₁₇。

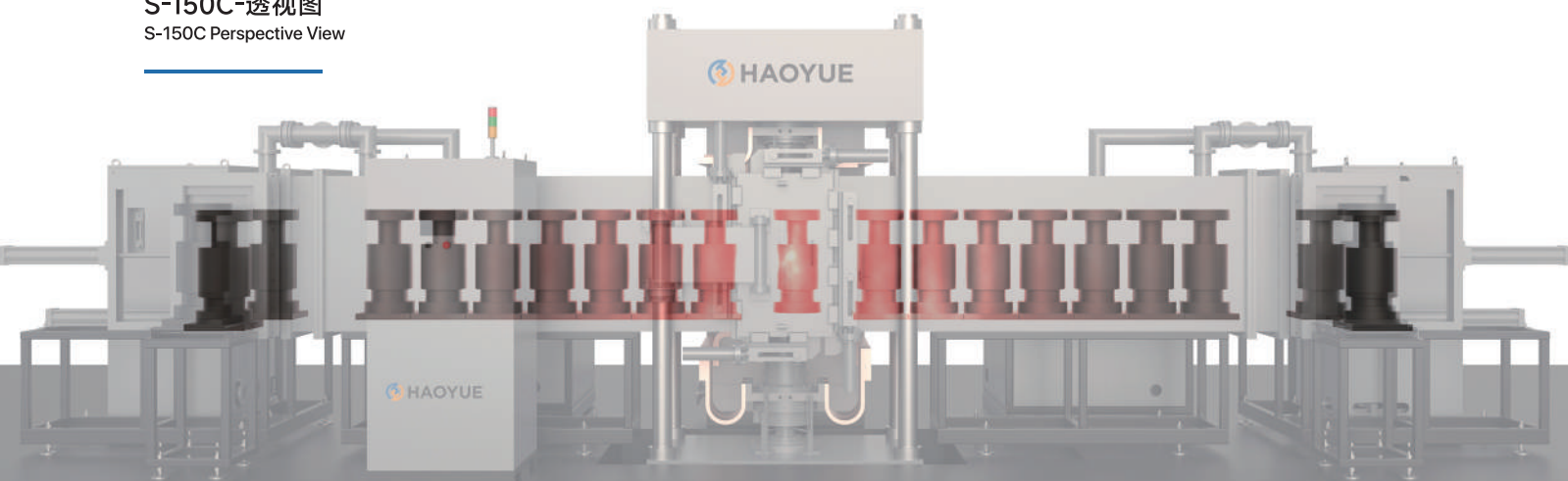
- Metals: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
- Ceramic Oxides: Al₂O₃, Mulitex ZrO₂, Mg, SiO₂, TiO₂, HfO₂.
- Carbides: SiC, B₄C, TaC, WC, ZrC, VC.
- Nitrides: Si₃N₄, TaN, TiN, AlN, ZrN, VN.
- Boride: TiB₂, HfB₂, LaB₆, ZrB₂, VB₂.
- Fluorides: LiF, CaF₂, MgF₂.
- Metal Ceramics: Si₃N₄+Ni, Al₂O₃+Ni, ZrO₂+Ni, Al₂O₃+Ti, SUS+WC/Co, BN+Fe, WC+Co+Fe.
- Metal Compounds: TiAl, MoSi₂, Si₃Zr₅, NiAl, NbCo, NbAl, Sm₂Co₁₇.

产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	样品直径(mm) Sample Dia. (mm)	机械压力(T) Mechanical Pressure (ton)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)
S-150C	连续式 Continuous	Φ150	100	10	2200
S-200C	连续式 Continuous	Φ200	200	10	2200

S-150C-透视图

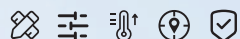
S-150C Perspective View



真空热压烧结炉

Vacuum Hot Pressing Sintering Furnace

P Series



设计优化好 / 温度均匀性好 / 升温速度快 / 压力精度高 / 安全性能好

Good Design Optimization / Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance

简介 / INTRODUCTION

真空热压烧结炉是在真空（或其它气氛）条件下将材料热压成型的成套设备，主要采用石墨电阻式加热，由油缸驱动的压头上下加压。在高温下，物料生坯固体颗粒的相互键联，晶粒长大，空隙（气孔）和晶界渐趋减少，通过物质的传递，其总体积收缩，密度增加，最后成为具有某种显微结构的致密多晶烧结体，从而将物料压制成形。

The vacuum hot pressing sintering furnace is a complete set of equipment for forming materials by hot pressing under vacuum or other atmospheric conditions. It primarily uses graphite resistance heating with pressurization applied up and down by an oil cylinder-driven piston. At high temperatures, the solid particles of raw material undergo mutual bonding, grain growth occurs, and voids (pores) and grain boundaries gradually decrease. Through matter transfer, the total volume shrinks and density increases, eventually forming a dense polycrystalline sintered body with a defined microstructure, thereby compressing the material into final shape.



P7VGR22等轴测图
P7VGR22 Isometric View

技术特点 / ADVANTAGES

- 采用立式、侧开门结构：装、卸模具精度高，操作方便；
 - 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
 - 升温快：升温速率1~10°C/分钟(≤1600°C)，升温速率1~5°C/分钟(>1600°C)；
 - 温度均匀性好：平均温度均匀性为±5°C(5点测温，恒温区1000°C保温2h后检测)；
 - 压力精度高：采用伺服液压控制系统，压力精度为±3‰；
 - 安全性能好：采用工控机+PLC+PID压力传感控制，安全可靠；
 - 密封性能好：上下动态压头均采用波纹管密封，确保不漏气；
 - 冷却速度快：设备可选配外循环快速冷却系统，可在2bar气体压力下快速冷却系统，保证工件热压完毕快速冷却，更加高效运行；
- **Vertical, Side-opening Structure:**
High precision in mold loading and unloading, easy to operate.
 - **Good Design Optimization:**
The hot zone of the heating chamber has been simulated and calculated in thermal state, with very high temperature uniformity. The configured heating elements and insulation layer are designed with modular optimization.
 - **Fast Heating Rate:**
1~10°C/minute (below 1600°C), 1~5°C/minute (above 1600°C).
 - **Good Temperature Uniformity:**
Average temperature uniformity is ±5°C (measured at 5 points, constant temperature zone at 1000°C after 2-hour holding).
 - **High Pressure Accuracy:**
Using a servo hydraulic control system with pressure accuracy of <±3‰.
 - **Excellent Safety Performance:**
Adopting industrial control computer + PLC + PID pressure sensing control, safe and reliable.
 - **Superior Sealing Performance:**
Both upper and lower dynamic pressure heads are sealed with corrugated bellows seals to ensure no air leakage.
 - **Fast Cooling Rate:**
Equipment can be optionally equipped with an external circulation rapid cooling system capable of rapid cooling under 2 bar gas pressure, ensuring fast cooling after hot pressing to enable more efficient operation.

应用领域 / APPLICATIONS

真空热压烧结炉广泛应用于各类复合材料、各类高导热材料、氧化锆/碳化硅/碳化硼/氮化硼或陶瓷类材料、铜基粉末材料、铁基粉末材料、铁铜基粉末材料等材料的零件净近成型、致密化处理。

诸如：飞机降落铁铜基粉类材料刹车盘、防弹衣、装甲车护板、直升飞机防弹装甲等。

Vacuum hot-press sintering furnaces are widely used for net-shape forming and densification treatment of components made from various composite materials, high thermal conductivity materials, niobium oxide, silicon carbide, boron carbide, boron nitride, ceramic materials, copper-based powder materials, iron-based powder materials, iron-copper-based powder materials, and other advanced materials.

For example: aircraft landing brake discs made from iron-copper-based powder materials, bulletproof vests, armored vehicle protective plates, helicopter bulletproof armor, and similar applications.

P5VGR22等轴测图

P5VGR22 Isometric View



产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	模套尺寸(mm) Die Dimensions (mm)	产品尺寸(mm) Sample Dia. (mm)	机械压力(T) Mechanical Pressure (ton)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)	适用工艺 Applications
P3VGR22	立式 Vertical	Φ300×400	Φ160	100	6.7×10 ⁻³	2200	热压/烧结 Hot Pressing / Sintering
P5VGR22	立式 Vertical	Φ500×700	Φ300	300	1/6.7×10 ⁻³	2200	热压/烧结 Hot Pressing / Sintering
P7VGR22	立式 Vertical	Φ700×900	Φ400	600	1/6.7×10 ⁻³	2200	热压/烧结 Hot Pressing / Sintering
P9VGR22	立式 Vertical	Φ900×900	Φ500	800	1/6.7×10 ⁻³	2200	热压/烧结 Hot Pressing / Sintering
P11VGR22	立式 Vertical	Φ1100×900	Φ600	1200	1/6.7×10 ⁻³	2200	热压/烧结 Hot Pressing / Sintering

一拖二真空热压烧结炉

Dual-Chamber Vacuum Hot Pressing Sintering Furnace

P Series



生产效率高 / 温度均匀性好 / 升温速度快 /
压力精度高 / 安全性能好

High Production Efficiency / Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance

P7VTGR22-II正视图

P7VTGR22-II Front View

简介 / INTRODUCTION

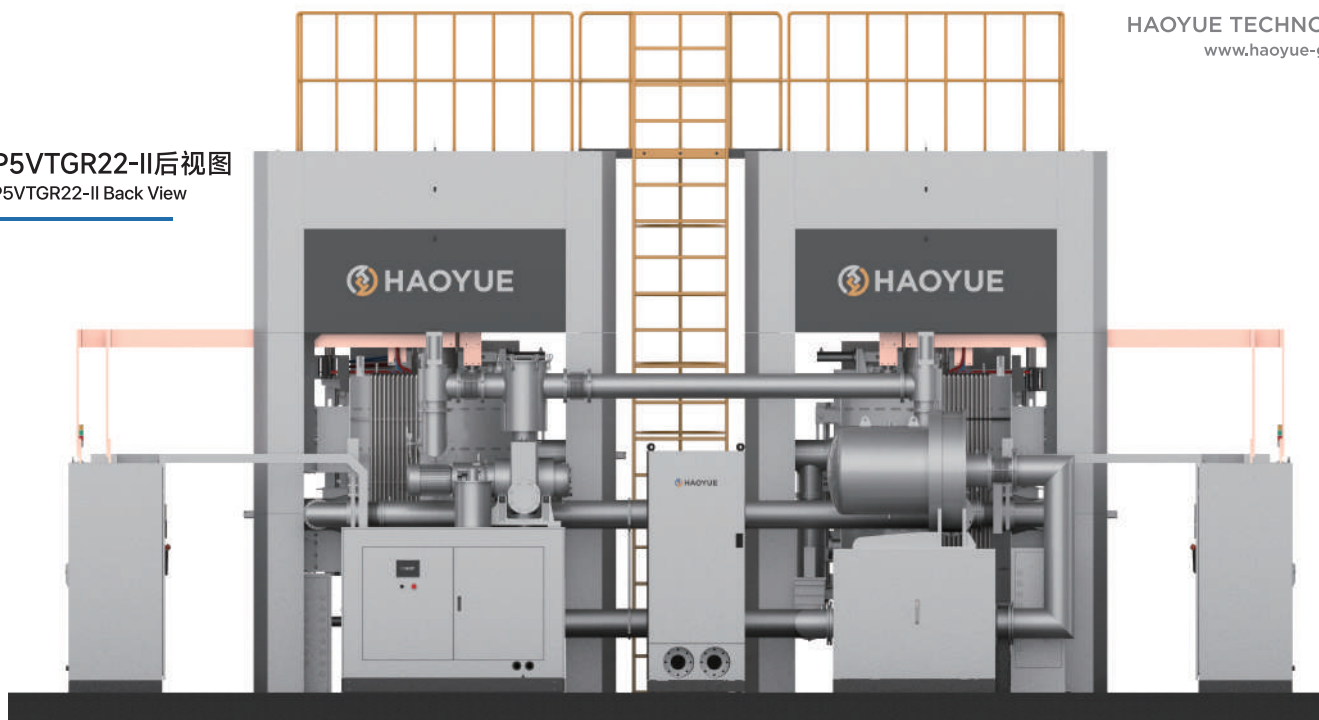
真空热压烧结炉是在真空（或其它气氛）条件下将材料热压成型的成套设备，主要采用石墨电阻，由油缸驱动的压头上下加压。在高温下，物料生坯固体颗粒的相互键联，晶粒长大，空隙（气孔）和晶界渐趋减少，通过物质的传递，其总体积收缩，密度增加，最后成为具有某种显微结构的致密多晶烧结体，从而将物料压制成形。

设计为一拖二，双压机、炉体、控制系统、动力系统，共用真空系统、快冷系统，占地小，成本低，效率高。

A vacuum hot-press sintering furnace is a complete set of equipment that forms materials by hot pressing under vacuum or other atmosphere conditions. The system primarily employs graphite resistance heating, with pressure heads driven by oil cylinders that apply downward and upward pressure. At high temperature, the solid particles in raw material billets achieve mutual bonding, promoting grain growth. Concurrently, voids (pores) and grain boundaries gradually decrease. Through matter transfer, the total volume contracts, density increases, and the material ultimately becomes a dense polycrystalline sintered body with specific microstructure, thereby compressing the material into final shape.

The furnace is designed in a one-to-two configuration with dual press machines and dual furnace bodies. The system features shared control systems, power systems, vacuum systems, and rapid cooling systems, resulting in compact footprint, low cost, and high efficiency.



P5VTGR22-II后视图
P5VTGR22-II Back View

技术特点 / ADVANTAGES

- 效率高：设计为一拖二，双压机、炉体、控制系统、动力系统，共用真空系统、快冷系统，占地小，成本低，效率高；
- 采用立式、侧开门结构：装、卸模具精度高，操作方便；
- 升温快：升温速率1~10°C/分钟($\leq 1600^{\circ}\text{C}$)，升温速率1~5°C/分钟($> 1600^{\circ}\text{C}$)；
- 设计优化好：加压室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
- 温度均匀性好：平均温度均匀性为 $\pm 5^{\circ}\text{C}$ (5点测温，恒温区1000°C保温2h后检测)；
- 压力精度高：采用伺服液压控制系统，压力精度为 $\leq \pm 3\%$ ；
- 采用多温区控制：预留多个测温孔，以便高温监测使用；
- 安全性能好：采用工控机+PLC+PID压力传感控制，安全可靠；
- 密封性能好：动态压头均采用波纹管密封，确保不漏气；
- 冷却速度快：设备标配外循环快速冷却系统，可在2bar气体压力下快速冷却系统，保证工件热压完毕快速冷却，更加高效运行。
- **High Production Efficiency:** Designed as a dual-press configuration sharing a single vacuum system, fast cooling system, furnace body, control system, and power system. Small footprint, low cost, high operational efficiency.
- **Vertical Side-Opening Door Structure:** Enables precise loading and unloading of molds with high accuracy and convenient operation.
- **Fast Heating Rate:** Heating rate of 1~10 $^{\circ}\text{C}/\text{minute}$ (below 1600 $^{\circ}\text{C}$); heating rate of 1~5 $^{\circ}\text{C}/\text{minute}$ (above 1600 $^{\circ}\text{C}$).
- **Optimized Design:** Thermal field of pressurized chamber calculated via thermal simulation, achieving very high temperature uniformity. Heating elements and insulation layers feature modular optimization design.
- **Good Temperature Uniformity:** Average temperature uniformity of $\pm 5^{\circ}\text{C}$ (measured at 5points; constant-temperature zone at 1000 $^{\circ}\text{C}$ maintained for 2 hours before testing).
- **High Pressure Accuracy:** Servo-hydraulic control system with pressure accuracy of $< \pm 3\%$.
- **Multi-Zone Temperature Control:** Multiple reserved temperature measurement holes enable real-time high-temperature monitoring.
- **Excellent Safety Performance:** Equipped with IPC + PLC + PID pressure sensor control for safe and reliable operation.
- **Superior Sealing Performance:** Dynamic pressure heads sealed with corrugated pipes ensure no air leakage.
- **Fast Cooling Rate:** Equipment supplied with external-circulation rapid cooling system. Achieves rapid cooling under 2 bar gas pressure after hot pressing, ensuring efficient operation.

产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	模具尺寸(mm) Die Dimensions (mm)	样品直径(mm) Sample Dia. (mm)	机械压力(T) Mechanical Pressure (ton)	压头行程(mm) Ram Stroke (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度($^{\circ}\text{C}$) Max. Temp. ($^{\circ}\text{C}$)	适用工艺 Applications
P5VTGR22-II	一拖二 Double Chambers	$\Phi 500 \times 700$	$\Phi 300$	300	双向总400	$1/6.7 \times 10^{-3}$	2200	热压/烧结 Hot Pressing / Sintering
P7VTGR22-II	一拖二 Double Chambers	$\Phi 700 \times 900$	$\Phi 400$	600	双向总400	$1/6.7 \times 10^{-3}$	2200	热压/烧结 Hot Pressing / Sintering

应用领域 / APPLICATIONS

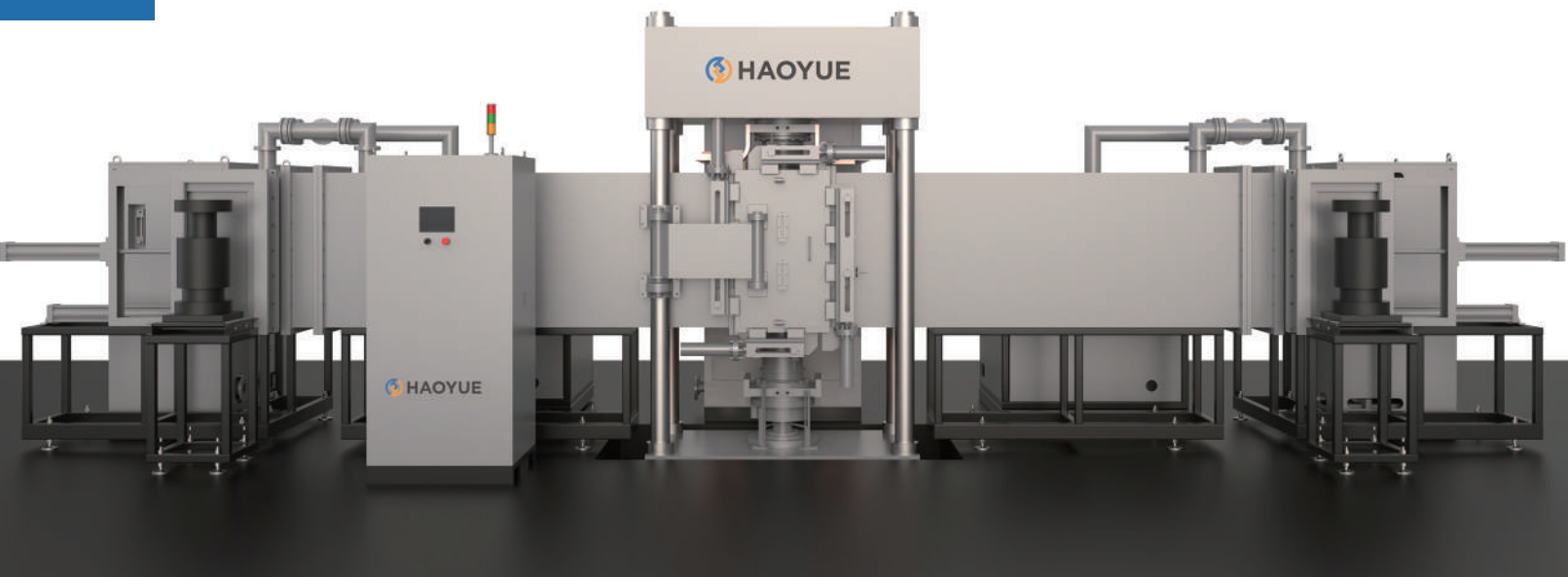
适用于氧化锆、碳化硅、碳化硼、氮化硼等陶瓷材料或石墨烯碳纤维、高温合金金属粉末材料的高温加压烧结成形及增密粉末冶金、功能陶瓷等新材料的高温热成型，也可用于粉末或压坯在低于主要组分熔点的温度下的热处理，目的在于通过颗粒间的冶金结合以提高其强度。

诸如：飞机降落铁铜基粉类材料刹车盘、防弹衣、装甲车护板、直升飞机防弹装甲等。

Suitable for high-temperature pressure sintering and densification of ceramic materials such as niobium oxide, silicon carbide, boron carbide, boron nitride, graphene carbon fiber, and high-temperature alloy metal powder materials in powder metallurgy and new functional ceramics. Also applicable for heat treatment of powder or compacts at temperatures below the melting point of the main component, achieving metallurgical bonding between particles to enhance strength.

Examples include: brake discs of iron-copper-based powder materials for aircraft landing gear, bulletproof vests, armored vehicle protective plates, and helicopter bulletproof armor.

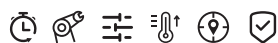
P7CGR22正视图
P7CGR22 Front View



连续式真空热压烧结炉

Continuous Hot Press Sintering Furnace

P Series



生产效率高 / 自动化程度高 / 温度均匀性好 / 升温速度快 /
压力精度高 / 安全性能好

High Production Efficiency / High Degree of Automation /
Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance



简介 / INTRODUCTION

连续式真空热压烧结炉是在真空（或其它气氛）条件下将材料热压成型的连续式成套设备，主要采用石墨电阻式加热，由油缸驱动的压头上下加压。在高温下，物料生坯固体颗粒的相互键联，晶粒长大，空隙（气孔）和晶界渐趋减少，通过物质的传递，其总体积收缩，密度增加，最后成为具有某种显微结构的致密多晶烧结体，从而将物料压制成形。

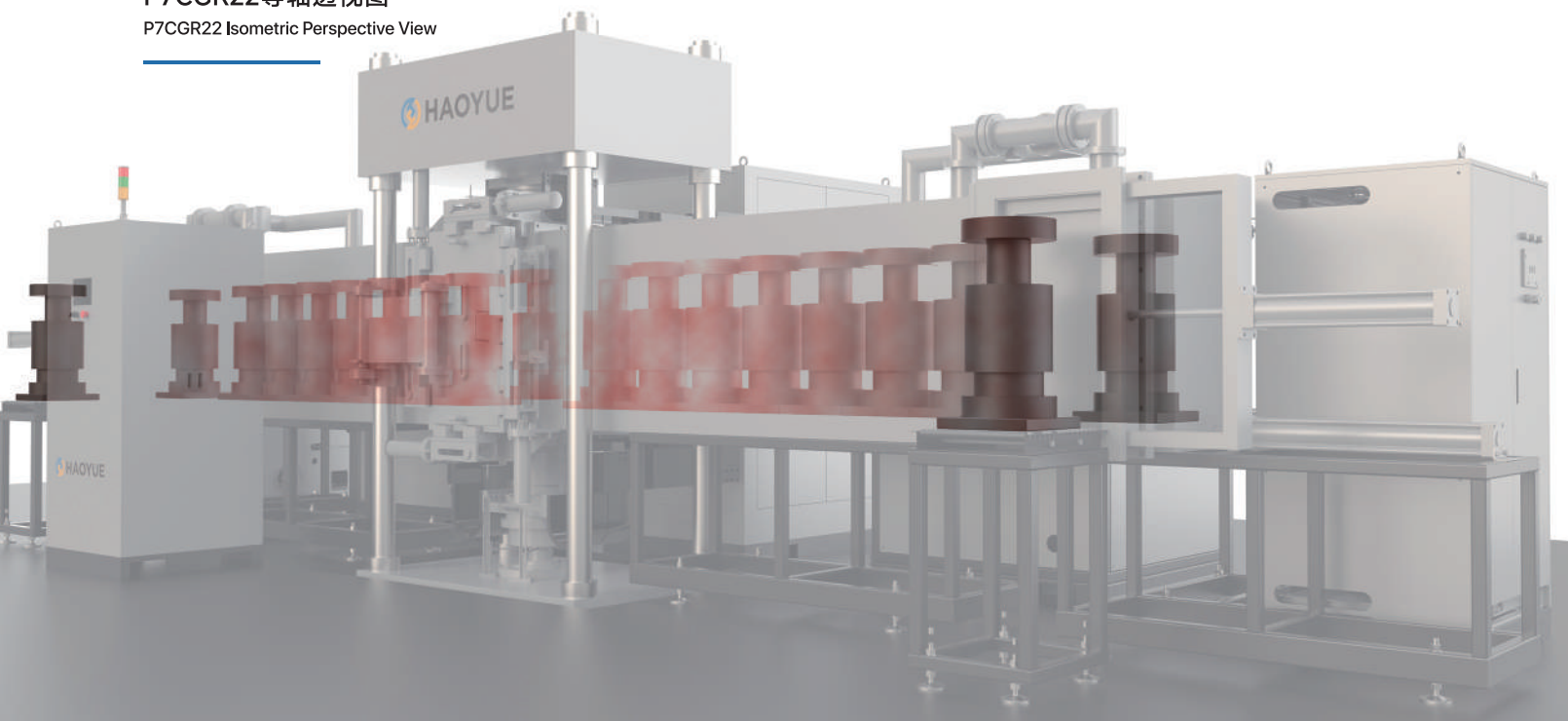
连续式真空热压设备具有先进、生产自动化程度高、处理量大、热压产品质量好等优点。可大大提高企业的生产效率，节约人工成本。

The continuous hot-press sintering furnace is a complete, continuous production system that forms materials through hot pressing under vacuum or other controlled atmospheric conditions. The equipment primarily employs graphite resistance heating, with pressure applied vertically by oil-cylinder-driven press heads. At elevated temperatures, solid particles in the raw material undergo mutual bonding, leading to grain growth while voids (pores) and grain boundaries progressively decrease. Through material transfer mechanisms, the total volume shrinks, density increases, and the material eventually becomes a dense, polycrystalline sintered body with defined microstructure, thereby achieving precision compression forming of the workpiece.

Continuous vacuum hot-pressing equipment offers substantial advantages, including advanced technology, high degree of production automation, large processing capacity, and consistent product quality. It significantly improves enterprise production efficiency and substantially reduces labor costs.

P7CGR22等轴透视图

P7CGR22 Isometric Perspective View



技术特点 / ADVANTAGES

- 采用多工位设计，可以连续生产，使得效率倍增；
- 升温快：升温速率1~10°C/分钟($\leq 1600^{\circ}\text{C}$)，升温速率1~5°C/分钟($> 1600^{\circ}\text{C}$)；
- 设计优化好：加压室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
- 温度均匀性好：平均温度均匀性为 $\pm 5^{\circ}\text{C}$ (5点测温，恒温区1000°C保温1h后检测)；
- 压力精度高：采用伺服液压控制系统，压力精度为 $\leq \pm 3\%$ ；
- 采用多温区控制：预留多个测温孔，以便高温监测使用；
- 安全性能好：采用工控机+PLC+PID压力传感控制，安全可靠；
- 密封性能好：动态压头均采用波纹管密封，确保不漏气；
- 自动化程度高：如选装自动装卸料系统，将可完全实现所有工序全自动运行，数字化、智能化、无需人工干预。

- Adopting a multi-station design enables continuous production, resulting in doubled efficiency.
- **Fast Heating Rate:**
Heating rate of 1~10°C/minute ($\leq 1600^{\circ}\text{C}$); heating rate of 1~5°C/minute ($> 1600^{\circ}\text{C}$).
- **Optimized Design:** The thermal field of the pressurized chamber has been verified through thermal-state simulation, demonstrating very high temperature uniformity. The heating elements and insulation layers are designed with modular optimization.
- **Good Temperature Uniformity:** Average temperature uniformity of $\pm 5^{\circ}\text{C}$ (measured at 5 points, after 1-hour constant-temperature dwell at 1000°C).
- **High Pressure Accuracy:** Using a servo-hydraulic control system, pressure accuracy is $\leq \pm 3\%$.
- **Multi-zone Temperature Control:** Multiple temperature measurement ports reserved for high-temperature monitoring.
- **Excellent Safety Performance:** Adopting industrial PC + PLC + PID pressure-sensing control for safe and reliable operation.
- **Superior Sealing Performance:** Dynamic pressure seals employ corrugated-tube design to ensure no air leakage.
- **High Degree of Automation:** Optional automatic loading/unloading system enables fully automated process execution, with digitalized and intelligent operation requiring no manual intervention.

应用领域 / APPLICATIONS

适用于氧化锆、碳化硅、碳化硼、氮化硼等陶瓷材料或石墨烯碳纤维、高温合金金属粉末材料的高温加压烧结成形及增密粉末冶金、功能陶瓷等新材料的高温热成型，也可用于粉末或压坯在低于主要组分熔点的温度下的热处理，目的在于通过颗粒间的冶金结合以提高其强度。

Suitable for high-temperature pressure sintering and densification of ceramic materials (niobium oxide, silicon carbide, boron carbide, boron nitride) and graphene, carbon-fiber, and high-temperature alloy metal powder materials; also suitable for high-temperature hot forming of new materials in powder metallurgy and functional ceramics. Can also be used for heat treatment of powder or compact materials at temperatures below the melting point of the main components, with the aim of improving strength through metallurgical bonding between particles.

产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	模具尺寸(mm) Die Dimensions (mm)	样品直径(mm) Sample Dia. (mm)	机械压力(T) Mechanical Pressure (ton)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)	适用工艺 Applications
P5CGR22	连续式 Continuous	$\Phi 500 \times 500$	$\Phi 300$	300	10	2200	热压/烧结 Hot Pressing / Sintering
P7CGR22	连续式 Continuous	$\Phi 700 \times 600$	$\Phi 400$	600	10	2200	热压/烧结 Hot Pressing / Sintering

真空扩散焊炉

Vacuum Diffusion Bonding Furnace

D Series



温度均匀性好 / 升温速度快 / 压力精度高 / 安全性能好 / 冷却速度快

Good Temperature Uniformity / Fast Heating Rate / High Pressure Accuracy
Excellent Safety Performance / Fast Cooling Rate

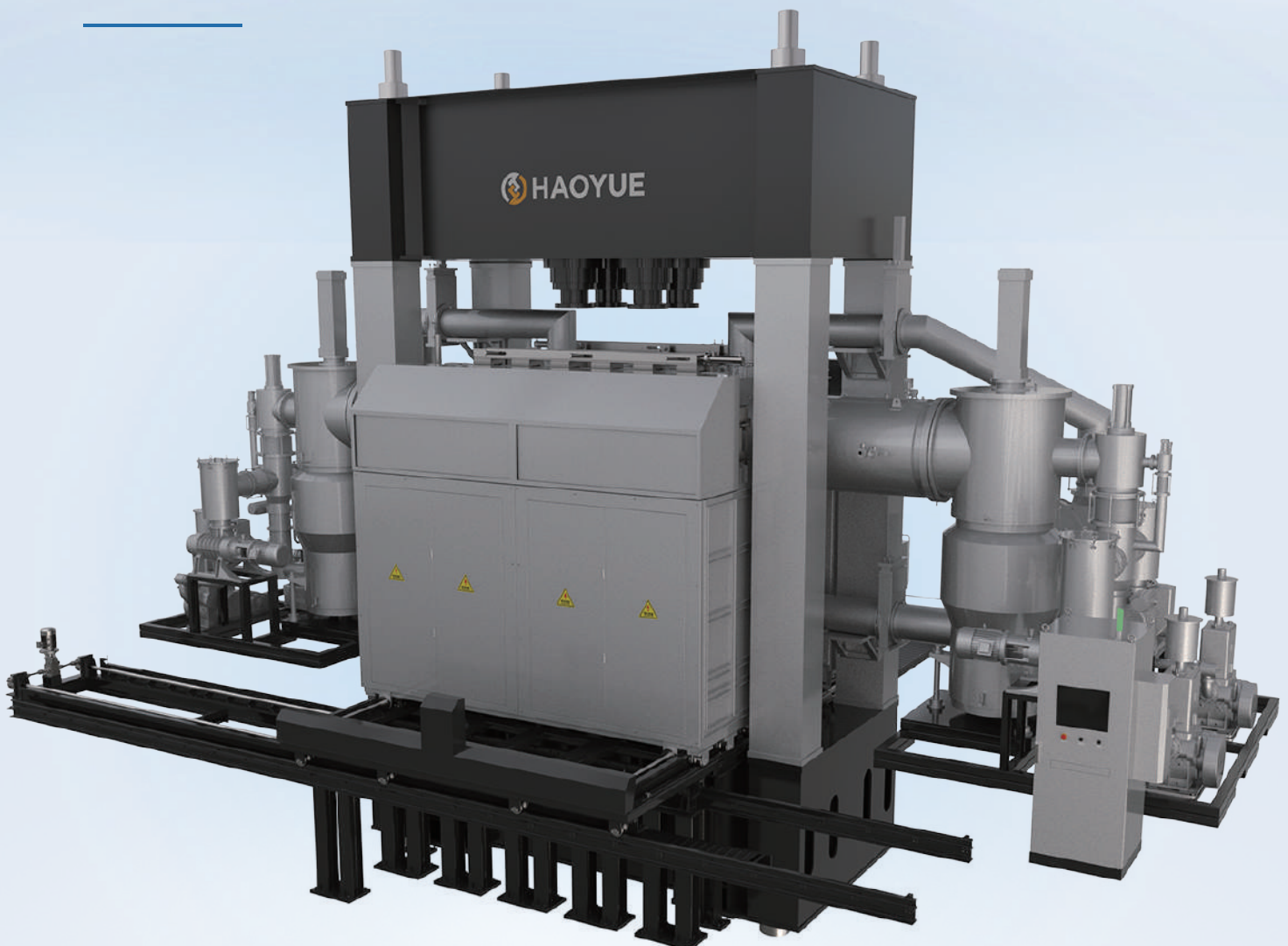
简介 / INTRODUCTION

扩散焊是指将工件在高温下加压，但不产生可见变形和相对移动的固态焊方法。扩散焊特别适合异种金属材料、耐热合金和陶瓷、金属间化合物、复合材料等新材料的接合，尤其是对熔焊方法难以焊接的材料，扩散焊具有明显的优势，日益引起人们的重视。

Diffusion bonding refers to a solid-state bonding method in which a workpiece is pressurized at high temperature but does not produce visible deformation or relative movement. Diffusion bonding is especially suitable for joining dissimilar metal materials, heat-resistant alloys, and new materials such as ceramics, intermetallic compounds, and composite materials. Particularly for materials that are difficult to weld by fusion bonding methods, diffusion bonding offers obvious advantages and has increasingly attracted significant attention.

D20等轴测图

D20 Isometric View



技术特点 / ADVANTAGES

- 扩散焊时因基体不过热、不熔化，可以在不降低被焊材料性能的情况下焊接几乎所有的金属或非金属材料，特别适合于熔焊和其他方法难以焊接的材料，如活性金属、耐热合金、陶瓷和复合材料等。对于塑性差或熔点高的同种材料，以及不互溶或在熔焊时会产生脆性金属间化合物的异种材料，扩散焊是较适宜的焊接方法。
- 扩散焊接头质量好，其显微组织和性能与母材接近或相同，在焊缝中不存在熔焊缺陷，也不存在过热组织和热影响区。焊接参数易于精确控制，批量生产时接头质量和性能稳定。
- 焊件精度高、变形小。因焊接时所加压力较小，工件多是整体加热，随炉冷却，故焊件整体塑性变形很小，焊后的工件一般不再进行机械加工。
- 可以焊接大截面工件为焊接所需压力不大，故大截面焊接所需设备的吨位不高，易于实现。
- 可以焊接结构复杂、接头不易接近以及厚薄相差较大的工件，能对组装件中的许多接头同时实施焊接。
- 冷却速度快：可选配2bar气体压力下快速冷却系统，保证工件热压完毕快速冷却，高效运行。
- During diffusion bonding, because the substrate does not overheat or melt, it is possible to bond almost all metals or non-metals without reducing the performance of the bonded material. It is particularly suitable for materials that are difficult to bond by fusion bonding and other methods, such as active metals, heat-resistant alloys, ceramics, and composite materials. For the same type of material with poor plasticity or high melting point, as well as dissimilar materials that are immiscible or produce brittle intermetallic compounds during fusion bonding, diffusion bonding is a more suitable welding method.
- The quality of diffusion bonded joints is excellent, with microstructure and properties close to or identical to the base metal. There are no fusion bonding defects, overheating structure, or heat-affected zone in the bond seam. Bonding parameters are easy to precisely control, and joint quality and performance are stable during mass production.
- Bonded parts have high accuracy and minimal deformation. Because the pressure applied during bonding is relatively low, the workpiece is mostly heated as a whole and cooled with the furnace, resulting in minimal overall plastic deformation of the welded part. The welded workpiece is generally not subjected to mechanical processing after bonding.
- It is possible to bond large section workpieces. Since the bonding pressure required is not large, the tonnage of equipment required for large section bonding is not high, making it easy to achieve.
- It can bond workpieces with complex structures, difficult-to-access joints, and significant thickness differences, and can simultaneously weld many joints in assembled parts.
- **Fast Cooling Rate:** Optional rapid cooling system under 2 bar gas pressure ensures fast cooling of the workpiece after hot pressing and efficient operation.

产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	机械压力(T) Mechanical Pressure (ton)	最高温度(°C) Max. Temp. (°C)	压头数量 Ram Qty.	气冷压强 Cooling Gas Pressure	应用范围 Applications
D4MO14	400×400	6.7×10^{-4}	20~200	1400	1	2Bar	扩散焊 Diffusion Bonding
D5MO14	500×600	6.7×10^{-4}	30~300	1400	1	2Bar	扩散焊 Diffusion Bonding
D6MO14	600×800	6.7×10^{-4}	50~400	1400	2	2Bar	扩散焊 Diffusion Bonding
D8MO14	1200×800	6.7×10^{-4}	100~800	1400	4	2Bar	扩散焊 Diffusion Bonding
D10MO14	1200×1000	6.7×10^{-4}	300~1000	1400	4	2Bar	扩散焊 Diffusion Bonding

应用领域 / APPLICATIONS

扩散焊特别适用于要求真空密封，要求接头与母材等强度，要求无变形的小零件。它是制造真空密封、耐热、耐振和不变形接头的唯一方法，因此在工业生产中得到广泛的应用。在电真空设备中金属与非金属的焊接，切削刀具中硬质合金、陶瓷、高速钢与碳钢的焊接，都有采用扩散焊接的方法。超音速飞机上的各种钛合金部件都是用超塑性成形-扩散焊接法制造的。还特别适用于焊接异种金属材料、石墨和陶瓷等非金属材料、弥散强化高温合金、金属基复合材料和多孔烧结材料。

扩散焊接已广泛应用于反应堆燃料元件、液压泵耐磨件、钻机、隼头、耐腐蚀件、蜂窝结构板、静电、叶轮、冲压模具、过滤管和电子元件的制造中。

Diffusion bonding is especially suitable for small parts that require vacuum sealing, equal strength of joints and base metals, and no deformation. It is the only method to manufacture vacuum-sealed, heat-resistant, vibration-resistant, and deformation-free joints, and therefore is widely used in industrial production. Diffusion bonding methods are used for bonding of metals and non-metals in electrovacuum equipment, and for bonding cemented carbide, ceramics, high-speed steel, and carbon steel in cutting tools. Various titanium alloy components on supersonic aircraft are manufactured using the superplastic forming-diffusion bonding method. Diffusion bonding is also particularly suitable for bonding dissimilar metal materials, non-metallic materials such as graphite and ceramics, dispersion-strengthened superalloys, metal matrix composites, and porous sintered materials. Diffusion bonding has been widely applied in the manufacture of reactor fuel elements, hydraulic pump wear-resistant parts, drilling rig mud shoe parts, corrosion-resistant components, honeycomb structural plates, electrostatic equipment, impellers, stamping dies, filter tubes, and electronic components.

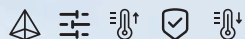
D4MO14等轴测图
D4MO14 Isometric View



真空炉(石墨加热)

Vacuum Furnace(Graphite)

V Series



稳定性好 / 温度均匀性好 / 升温速度快 / 安全性能好 / 冷却速度快

High Stability / Good Temperature Uniformity / Fast Heating Rate /

Excellent Safety Performance / Fast Cooling Rate

简介 / INTRODUCTION

该真空炉是用石墨作发热元件的真空电阻炉，主要应用于陶瓷、硬质合金、复合材料等在真空或保护气氛中高温烧结或退火等热处理，也可以供金属材料在真空条件下的高温热处理或贵金属材料的除气处理。

This vacuum furnace is a vacuum resistance furnace that uses graphite as the heating element. It is primarily designed for high-temperature sintering or annealing of ceramics, hard alloys, and composite materials in vacuum or protective atmospheres. The furnace is also suitable for high-temperature heat treatment of metal materials under high-vacuum conditions and for degassing treatment of precious metal materials.

V5GR24-Plus正视图

V5GR24-Plus Front View



技术特点 / ADVANTAGES

- 采用卧式、侧开门结构：装卸物料，操作方便；
- 升温快：升温速率1~15°C/分钟($\leq 1600^{\circ}\text{C}$)，升温速率1~10°C/分钟($> 1600^{\circ}\text{C}$)；
- 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
- 采用多温区控制：预留多个测温孔，以便高温监测使用；
- 温度均匀性好：平均温度均匀性为 $\pm 5^{\circ}\text{C}$ （5点测温，恒温区 1000°C 保温1h后检测）；
- 冷却速度快：可选配2bar气体压力下快速冷却系统，保证工件快速冷却，高效运行；
- 稳定性好：设备长时间运行稳定，故障率非常低；
- 安全性能好：采用工控机+PLC+PID程序控温，安全可靠；
- 可拓展性强：可烧结、退火、脱脂、除气等。

- **Horizontal Side-door Structure:**
Loading and unloading materials is convenient and easy to operate.
- **Fast Heating Rate:** Heating rate of 1~15°C/minute ($< 1600^{\circ}\text{C}$); heating rate of 1~10°C/minute ($> 1600^{\circ}\text{C}$).
- **Optimized Design:**
The heating chamber thermal field has been simulated and calculated under thermal conditions, exhibiting very high temperature uniformity. The heating elements and insulation layer employ modular optimization design.
- **Multi-zone Temperature Control:**
Multiple temperature measurement ports are reserved for high-temperature monitoring purposes.
- **Good Temperature Uniformity:**
Average temperature uniformity of $\pm 5^{\circ}\text{C}$ (5-point temperature measurement; isothermal zone at 1000°C maintained for 1 hour before detection).
- **Fast Cooling Rate:**
Optional fast cooling system under 2bar gas pressure ensuring rapid workpiece cooling and efficient operation.
- **High Stability:**
Equipment operates stably over extended periods with very low failure rate.
- **Excellent Safety Performance:**
Employs industrial control computer + PLC + PID temperature control program for safe and reliable operation.
- **Strong Scalability:**
Capable of sintering, annealing, degreasing, degassing, and other processes.

应用领域 / APPLICATIONS

本设备为周期作业式，可供石墨电极、陶瓷等在高温、高真空条件下进行烧结处理，也可在充入保护气氛情况下烧结，也可以对碳纤维毡进行气氛保护提纯处理，烧结工艺在许多如合金行业、冶金行业等工业行业得到大量应用如硬质合金、耐火材料、粉末冶金、超高温材料烧成等都需要应用烧结工艺。

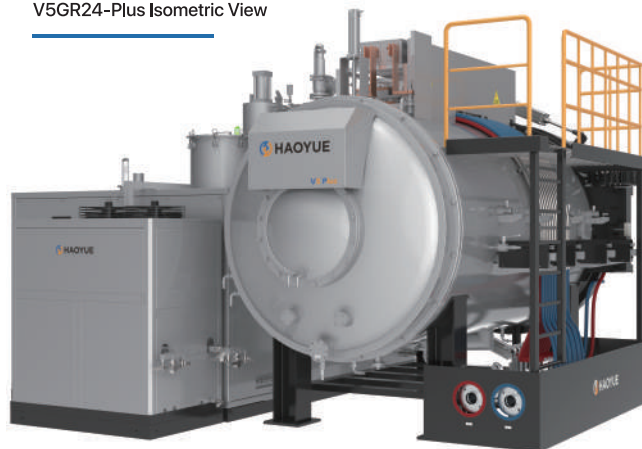
如炭/炭刹车盘、炭炭板材、热压模具、高温发热体/紧固件、热场材料、石墨制品、碳纸、碳布、石墨烯、碳纳米管、导热膜等。

This equipment is a batch-operation furnace suitable for sintering treatment of graphite electrodes, ceramics, and similar materials under high temperature and high vacuum conditions. It can also perform sintering under protective atmosphere conditions or conduct atmosphere-protected purification treatment of carbon fiber felt. Sintering processes have been widely applied across many industrial sectors, including alloy and metallurgical industries. Applications such as hard alloys, refractory materials, powder metallurgy, and ultra-high-temperature material sintering all require sintering technology.

Examples include: carbon/carbon brake discs, carbon/carbon plate materials, hot-pressing molds, high-temperature heating elements/fasteners, thermal field materials, graphite products, carbon paper, carbon cloth, graphene, carbon nanotubes, thermal conductive films, and more.

V5GR24-Plus等轴测图

V5GR24-Plus Isometric View



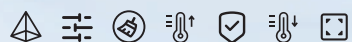
产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度($^{\circ}\text{C}$) Max. Temp. ($^{\circ}\text{C}$)	适用工艺 Applications
V3GR24	300×300×400	6.7×10^{-3}	2000/2400	烧结/退火/脱脂 Sintering/Annealing/Degreasing
V4GR24	400×400×600	6.7×10^{-3}	2000/2400	烧结/退火/脱脂 Sintering/Annealing/Degreasing
V6GR24	600×600×900	6.7×10^{-3}	2000/2400	烧结/退火/脱脂 Sintering/Annealing/Degreasing
V7GR24	700×700×1000	6.7×10^{-3}	2000/2400	烧结/退火/脱脂 Sintering/Annealing/Degreasing
V8GR24	800×800×1200	6.7×10^{-3}	2000/2400	烧结/退火/脱脂 Sintering/Annealing/Degreasing

真空炉(钼带加热)

Vacuum Furnace (Moly)

V Series



稳定性高 / 温度均匀性好 / 炉膛洁净度高 / 升温速度快 /
安全性能好 / 冷却速度快 / 拓展性强

High Stability / Good Temperature Uniformity / High Chamber Cleanliness /
Fast Heating Rate / Excellent Safety Performance / Fast Cooling Rate /
Strong Expandability

简介 / INTRODUCTION

该真空炉是用钼带作发热元件的真空电阻炉，主要应用于陶瓷、硬质合金、复合材料、金属材料等在真空或保护气氛中高温烧结、退火、钎焊，也可以供金属材料在真空条件下的高温热处理或贵金属材料的除气处理。

This vacuum furnace is a vacuum resistance furnace that uses molybdenum strips as heating elements, primarily applied for high-temperature sintering, annealing, and brazing of ceramics, hard alloys, composite materials, metal materials and other materials in vacuum or protective atmospheres. It can also be used for high-temperature heat treatment of metal materials under high vacuum conditions or degassing treatment of precious metal materials.

V7MO14等轴测图

V7MO14 Isometric View



技术特点 / ADVANTAGES

- 采用卧式、侧开门结构：装、卸料精度高，操作方便；
- 升温快：升温速率1~15°C/分钟(≤1300°C)；
- 温度均匀性好：平均温度均匀性为±5°C(5点测温，恒温区1000°C保温1h后检测)；
- 采用多温区控制：预留多个测温孔，以便高温监测使用；
- 安全性能好：采用工控机+PLC+PID程序控温，安全可靠；
- 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
- 冷却速度快：可选配2bar气体压力下快速冷却系统，保证工件快速冷却，高效运行；
- 可拓展性强：可烧结、钎焊、退火、脱脂、脱氧、脱气、还原等。

- **Horizontal and Side-opening Door Structure:**
High loading and unloading accuracy; convenient operation.
- **Fast Heating Rate:**
Heating rate of 1~15°C/minute (<1300°C).
- **Good Temperature Uniformity:**
Average temperature uniformity of ±5°C (5-point temperature measurement; constant temperature zone at 1000°C maintained for 1 hour before measurement).
- **Multi-zone Temperature Control:**
Multiple temperature measurement ports reserved for high-temperature monitoring purposes.
- **Excellent Safety Performance:**
Utilizing industrial computer + PLC + PID program for temperature control; safe and reliable.
- **Good Design Optimization:**
The heating chamber thermal field has undergone thermal state simulation and calculation, achieving very high temperature uniformity; heating elements and insulation layer employ modular optimization design.
- **Fast Cooling Rate:**
Optional fast cooling system under 2bar gas pressure available to ensure rapid workpiece cooling and efficient operation.
- **Strong Scalability:**
Capable of sintering, brazing, annealing, degreasing, deoxidation, degassing, reduction, and other processes.

应用领域 / APPLICATIONS

高真空钼带炉主要用于有色金属、不锈钢、钛合金、高温合金、硬质合金等材料烧结、退火、真空钎焊、除气等工艺。

High vacuum molybdenum-strip furnace is mainly used for sintering, annealing, vacuum brazing, degassing, and other processes for materials such as non-ferrous metals, stainless steel, titanium alloys, high-temperature alloys, hard alloys, etc.

V7MO14等轴测图

V7MO14 Isometric View



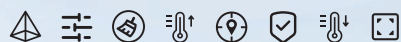
主要规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)	适用工艺 Applications
V4MO13	400×400×600	6.7×10 ⁻⁴	1000/1300	烧结/退火/脱脂/氢气/钎焊/脱气 Sintering/Annealing/Hydrogen/Degreasing/Brazing/Degassing
V6MO13	600×600×900	6.7×10 ⁻⁴	1000/1300	烧结/退火/脱脂/氢气/钎焊/脱气 Sintering/Annealing/Hydrogen/Degreasing/Brazing/Degassing
V7MO13	700×700×1000	6.7×10 ⁻⁴	1000/1300	烧结/退火/脱脂/氢气/钎焊/脱气 Sintering/Annealing/Hydrogen/Degreasing/Brazing/Degassing
V8MO13	800×800×1200	6.7×10 ⁻⁴	1000/1300	烧结/退火/脱脂/氢气/钎焊/脱气 Sintering/Annealing/Hydrogen/Degreasing/Brazing/Degassing
V10MO13	1000×1000×1400	6.7×10 ⁻⁴	1000/1300	烧结/退火/脱脂/氢气/钎焊/脱气 Sintering/Annealing/Hydrogen/Degreasing/Brazing/Degassing

真空炉(钨带加热)

Vacuum Furnace (Tungsten)

V Series



稳定性高 / 温度均匀性好 / 炉膛洁净度高 / 升温速度快 /
安全性能好 / 冷却速度快 / 拓展性强

High Stability / Good Temperature Uniformity / High Chamber Cleanliness /
Fast Heating Rate / Excellent Safety Performance / Fast Cooling Rate /
Strong Expandability

简介 / INTRODUCTION

该真空炉是用钨带作发热元件的真空电阻炉，主要应用于陶瓷、硬质合金、复合材料等在真空或保护气氛中高温烧结、退火，也可以供金属材料在高真空条件下的高温热处理或贵金属材料的除气处理。

This vacuum furnace is a vacuum resistance furnace that uses tungsten strips as heating elements. It is mainly applied for high-temperature sintering and annealing of ceramics, hard alloys, composite materials, and similar materials under vacuum or protective atmosphere. It can also be used for high-temperature heat treatment of metal materials under high vacuum conditions or for degassing of precious metal materials.

V4W20等轴测图

V4W20 Isometric View



技术特点 / ADVANTAGES

- 采用卧式、侧开门结构：装、卸料精度高，操作方便；
- 升温快：升温速率1~15°C/分钟(≤1600°C)；升温速率1~10°C/分钟(>1600°C)；
- 温度均匀性好：平均温度均匀性为±5°C(5点测温，恒温区1000°C保温1h后检测)；
- 安全性能好：采用工控机+PLC+PID程序控温，安全可靠；
- 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
- 自动化程度高：多参数记录监控，友善化人机界面，运行稳定；
- 冷却速度快：可选配2bar气体压力下快速冷却系统，保证工件快速冷却，高效运行；
- 可拓展性强：可烧结、退火、钎焊、脱气、氢气等。

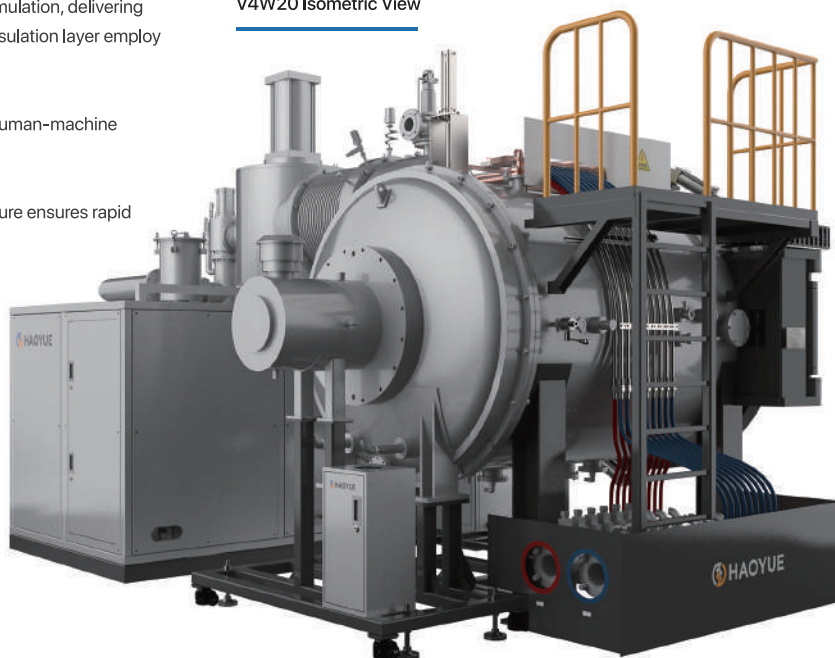
- **Horizontal Side-opening Door Design:**
High loading and unloading accuracy, convenient operation
- **Fast Heating Rate:**
Heating rate 1~15°C/minute (below 1600°C);
heating rate 1~10°C/minute (above 1600°C)
- **Good Temperature Uniformity:**
Average temperature uniformity ±5°C (5-point measurement, constant-temperature zone at 1000°C after 1-hour stabilization)
- **Excellent Safety Performance:**
Employs industrial control computer + PLC + PID programmable temperature control, safe and reliable
- **Optimized Design:**
Heating chamber thermal field verified through thermal simulation, delivering very high temperature uniformity; heating elements and insulation layer employ modular optimization
- **High Automation:**
Multi-parameter recording and monitoring, user-friendly human-machine interface, stable operation
- **Fast Cooling Rate:**
Optional rapid cooling system operating at 2bar gas pressure ensures rapid workpiece cooling and efficient operation
- **Strong Scalability:**
Capable of sintering, annealing, brazing, degassing, hydrogen atmosphere treatment, and more.

应用领域 / APPLICATIONS

主要用于金属粉末制品、金属丝网制品、陶瓷硬质合金、新材料及复合材料等真空烧结，应用于透明陶瓷、工业陶瓷等金属以及由难溶金属组成的合金材料以及陶瓷材料碳化硅及氮化硅的高温烧结。

Mainly used for vacuum sintering of metal powder products, metal wire mesh products, ceramic cemented carbides, new materials, and composite materials. Applied to high-temperature sintering of metals such as transparent ceramics and technical ceramics, as well as alloy materials composed of refractory metals and ceramic materials including silicon carbide and silicon nitride.

V4W20等轴测图
V4W20 Isometric View



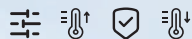
产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)	适用工艺 Applications
V3W20	300×300×400	6.7×10 ⁻⁴	1800/2000	烧结/退火/氢气/钎焊/脱气 Sintering/Annealing/Degreasing/Brazing/Degassing
V4W20	400×400×600	6.7×10 ⁻⁴	1800/2000	烧结/退火/氢气/钎焊/脱气 Sintering/Annealing/Degreasing/Brazing/Degassing
V5W20	500×500×700	6.7×10 ⁻⁴	1800/2000	烧结/退火/氢气/钎焊/脱气 Sintering/Annealing/Degreasing/Brazing/Degassing
V6W20	600×600×900	6.7×10 ⁻⁴	1800/2000	烧结/退火/氢气/钎焊/脱气 Sintering/Annealing/Degreasing/Brazing/Degassing

真空炉(感应加热)

Vacuum Furnace (Induction)

V Series



温度均匀性好 / 升温速度快 / 安全性能好 / 冷却速度快

Good Temperature Uniformity / Fast Heating Rate /

Excellent Safety Performance / Fast Cooling Rate

V6CO24等轴测图

V6CO24 Isometric View

简介 / INTRODUCTION

真空感应炉是采用感应加热方式，主要应用于陶瓷、硬质合金、复合材料等在真空或保护气氛中高温烧结、退火，也可以供金属材料在真真空条件下的高温热处理或贵金属材料的除气处理。

该设备的结构设计先进合理，设计及制造符合相应的国家及行业标准和规范，能够满足用户的使用要求。其配套产品和元器件具有国际先进水平，能够适应长期、稳定、安全、可靠的生产需求。

设备的节能效果好。使用、操作、维修方便简捷，造型美观，安全可靠，售后服务优良。

Vacuum induction furnaces employ induction heating technology and are primarily used for high-temperature sintering and annealing of ceramics, hard alloys, composite materials, and similar materials in vacuum or protective atmospheres. They can also be utilized for high-temperature heat treatment of metallic materials under high-vacuum conditions or for degassing treatment of precious metal materials.

The equipment features advanced and rational structural design. Its design and manufacture comply with applicable national and industry standards and specifications, meeting all user requirements. Accompanying products and components are at the international advanced level and are suited for sustained, stable, safe, and reliable production operations.

The equipment delivers excellent energy efficiency. It is convenient and simple to use, operate, and maintain; features an attractive appearance; operates safely and reliably; and is backed by superior after-sales service.



技术特点 / ADVANTAGES

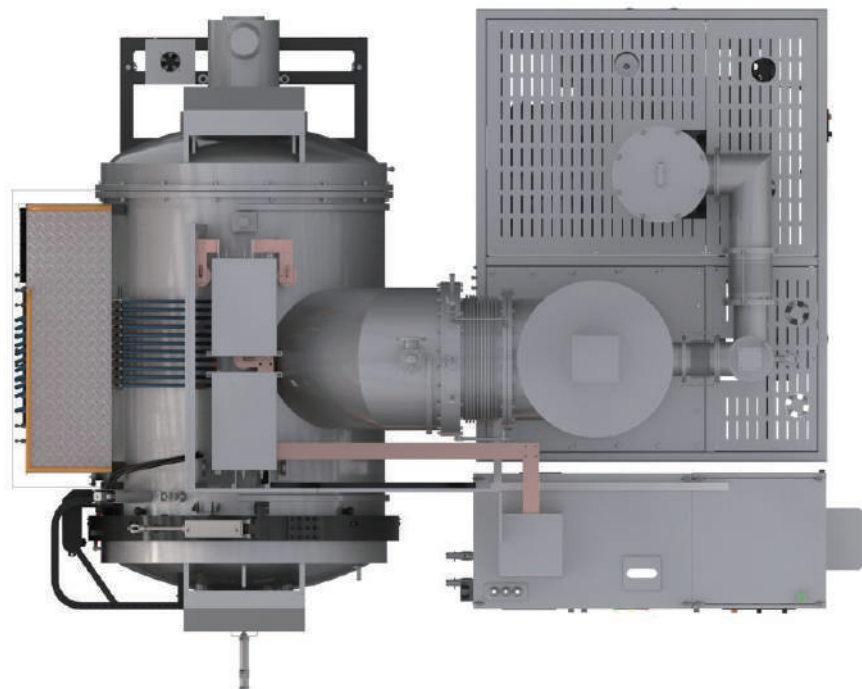
- 采用卧式、侧开门结构：装、卸料精度高，操作方便；
 - 升温快：升温速率1~60°C/分钟($\leq 1600^{\circ}\text{C}$)，升温速率1~20°C/分钟($> 1600^{\circ}\text{C}$)；
 - 采用多温区控制：预留多个测温孔，以便高温监测使用；
 - 安全性能好：采用工控机+PLC+PID程序控温，安全可靠；
 - 设计优化好：加热室感应热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
 - 可拓展：可烧结、退火、脱脂等。
- **Horizontal Side-opening Door Structure:**
Ensures high loading and unloading accuracy with convenient operation.
 - **Fast Heating Rate:**
Heating rate of 1~60°C/min (below 1600°C),
heating rate of 1~20°C/min (above 1600°C).
 - **Multi-temperature Zone Control:**
Multiple temperature measurement ports reserved for high-temperature monitoring.
 - **Excellent Safety Performance:**
Employs IPC+PLC+PID programmable temperature control for safe and reliable operation.
 - **Optimized Design:**
Induction thermal field in the heating chamber has been validated via thermal simulation; delivers very high temperature uniformity. Heating elements and insulation layers incorporate modular optimization design.
 - **Expandable Functionality:**
Capable of sintering, annealing, degassing, and other operations.

应用领域 / APPLICATIONS

本真空炉为周期作业式，可供石墨电极、陶瓷等在高温、高真空条件下进行烧结处理，也可在充入保护气氛情况下烧结，在许多钢铁行业、冶金行业、陶瓷行业等工业行业得到大量应用如硬质合金、陶瓷、耐火材料、粉末冶金、超高温材料烧成等都需要应用。

This vacuum furnace operates on a periodic batch basis and is suitable for sintering treatment of graphite electrodes, ceramics, and similar materials under high-temperature, high-vacuum conditions. It can also perform sintering operations under a protective atmosphere. The furnace is widely deployed across many industrial sectors, including steel, metallurgy, and ceramics, and serves applications such as hard alloys, ceramics, refractory materials, powder metallurgy, and ultra-high-temperature material firing.

V6CO24俯视图
V6CO24 Overlooking View



产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)	适用工艺 Applications
V6CO24	600×600×900	5	2000/2400	烧结/退火/脱脂 Sintering/Annealing/Degreasing
V8CO24	800×800×1200	5	2000/2400	烧结/退火/脱脂 Sintering/Annealing/Degreasing

V6CGR20等轴测图
V6CGR20 Isometric View



连续式真空炉(石墨加热)

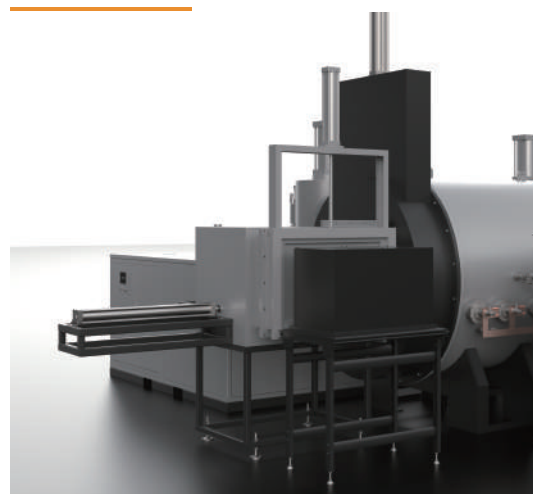
Continuous Vacuum Furnace (Graphite)

V Series



生产效率高 / 温度均匀性好 / 升温速度快 / 安全性能好 /
自动化程度高

High Production Efficiency / Good Temperature Uniformity /
Fast Heating Rate / Excellent Safety Performance /
High Degree Of Automation



简介 / INTRODUCTION

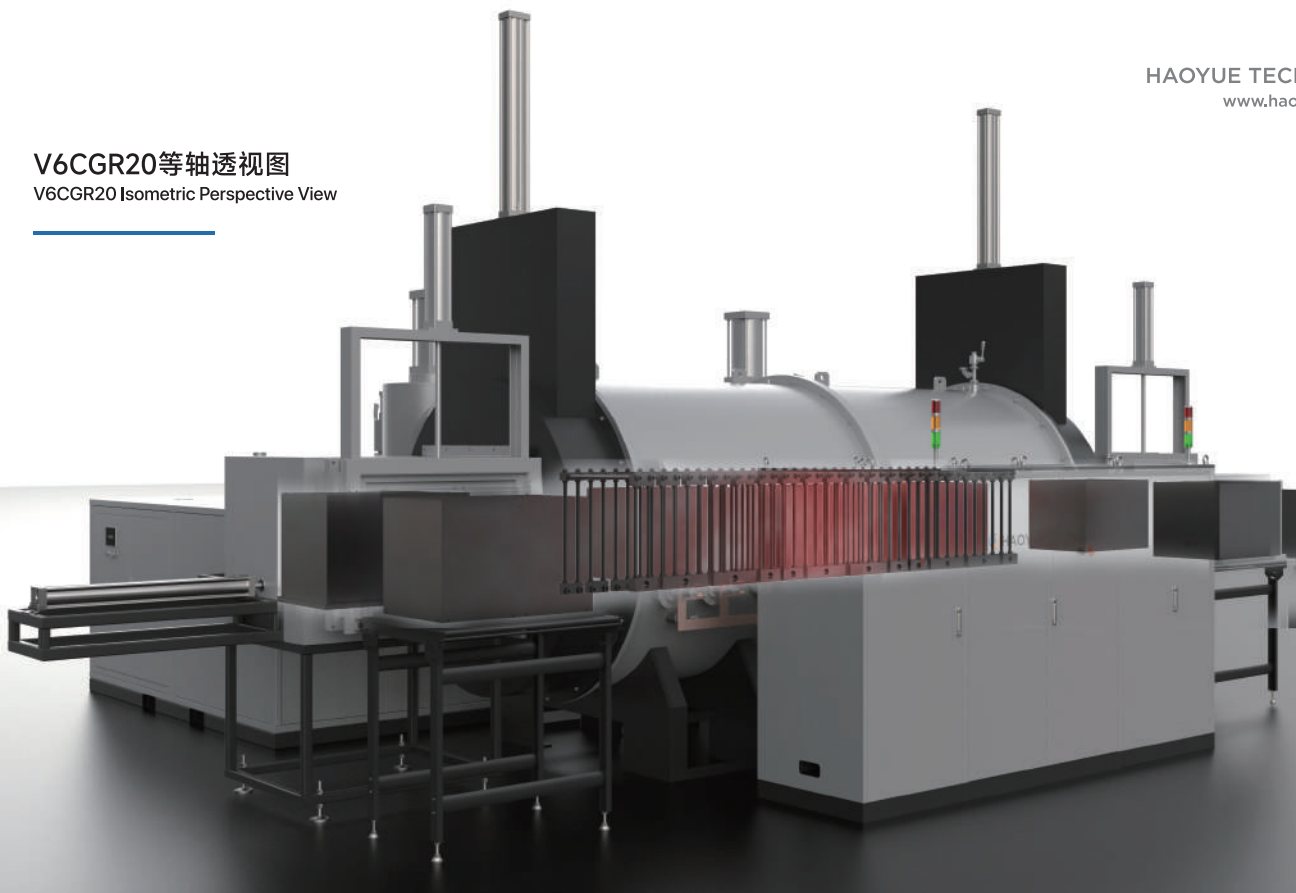
该连续式真空炉是用石墨作发热元件的真空电阻炉，主要应用于陶瓷、硬质合金、复合材料等在真空或保护气氛中高温烧结或退火等热处理工艺的成套设备，也可以供金属材料在真空条件下的高温热处理或贵金属材料的除气处理。

连续式真空炉具有先进、生产自动化程度高、处理量大、热处理产品质量好等优点，可大大提高企业的生产效率，节约人工成本。

This continuous vacuum furnace is a vacuum resistance furnace that uses graphite as the heating element. It is mainly used as a complete set of equipment for high-temperature sintering or annealing of ceramics, hard alloys, composite materials, and other materials in vacuum or protective atmosphere. It can also be used for high-temperature heat treatment of metal materials under high vacuum conditions or degassing treatment of precious metal materials.

Continuous vacuum furnaces feature advanced technology, high degree of production automation, large processing capacity, and excellent heat-treated product quality. They significantly improve production efficiency and reduce labor costs.

V6CGR20等轴透视图
V6CGR20 Isometric Perspective View



技术特点 / ADVANTAGES

- 采用多工位设计，可以连续生产，使得效率倍增；
- 升温快：升温速率1~10°C/分钟(≤1600°C)，升温速率1~5°C/分钟(>1600°C)；
- 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
- 温度均匀性好：平均温度均匀性为±5°C(5点测温，恒温区1000°C保温1h后检测)；
- 采用多温区控制：预留多个测温孔，以便高温监测使用；
- 安全性能好：采用工控机+PLC+PID程序控温，安全可靠；
- 自动化程度高：如选装自动装卸料系统，将可完全实现所有工序全自动运行，数字化、智能化、无需人工干预；
- 可拓展：烧结、退火。
- Adopting a multi-station design, continuous production can be achieved, resulting in doubled efficiency.
- **Fast Heating Rate:** Heating rate of 1~10°C/minute (below 1600°C), heating rate of 1~5°C/minute (above 1600°C).
- **Good Design Optimization:** The heating chamber thermal field has been thermally simulated and calculated, providing very high temperature uniformity. The heating elements and insulation layer employ modular optimization design.
- **Good Temperature Uniformity:** Average temperature uniformity of ±5°C (5-point temperature measurement, after 1 hour of thermal stabilization at 1000°C).
- **Multi-zone Temperature Control:** Multiple temperature measurement ports are provided for high-temperature monitoring.
- **Excellent Safety Performance:** Features an industrial control computer + PLC + PID program-based temperature control, ensuring safe and reliable operation.
- **High Degree of Automation:** Optional automatic loading and unloading system enables fully automated operation of all processes, delivering digitalization and intelligent control with no manual intervention required.
- **Versatile:** Suitable for sintering and annealing applications.

产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)	适用工艺 Applications
V6CGR20	600×600×900	10	2000	烧结/退火 Sintering / Annealing
V8CGR20	800×800×1200	10	2000	烧结/退火 Sintering / Annealing

应用领域 / APPLICATIONS

本设备为连续作业式，可供石墨电极、陶瓷等在高温、高真空条件下进行烧结处理，也可在充入保护气氛情况下烧结，也可以对碳纤维毡进行气氛保护提纯处理。

烧结工艺在许多钢铁行业、冶金行业、陶瓷行业等工业行业得到大量应用如硬质合金、陶瓷、耐火材料、粉末冶金、超高温材料烧成等都需要应用烧结工艺。如炭/炭刹车盘、炭炭板材、晶体炉热场、热压模具、高温发热体/紧固件、热场材料、石墨制品、碳纸、碳布、石墨烯、碳纳米管、导热膜等。

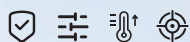
This equipment is a continuous-operation furnace designed for sintering of graphite electrodes, ceramics, and similar materials under high-temperature, high-vacuum conditions. It can also operate under a protective atmosphere and can perform protective-atmosphere treatment and purification of carbon fiber felt.

Sintering technology is widely applied across numerous industrial sectors, including steel, metallurgy, and ceramics. Applications requiring sintering processes include hard alloys, ceramics, refractory materials, powder metallurgy, and ultra-high-temperature materials firing. Typical products include carbon / carbon brake discs, carbon/carbon plate stock, crystal-furnace hot zones, hot-press molds, high-temperature heating elements/fasteners, thermal field materials, graphite products, carbon paper, carbon cloth, graphene, carbon nanotubes, and thermally conductive films.

氢气炉

Vacuum Hydrogen Furnace

H Series



安全性能好 / 温度均匀性好 / 升温速度快 / 温度控制精度高

Excellent Safety Performance / Good Temperature Uniformity /
Fast Heating Rate / High Temperature Control Accuracy

简介 / INTRODUCTION

真空氢气炉是一种集真空与氢气气氛环境于一体的特种热处理设备。它通过真空系统排除炉内空气，引入氢气作为保护或还原气氛，利用高效加热元件（使用钼带加热）与精准控温系统，实现对温度、气氛的精确调控。皓越科技此设备具有安全性能强、加热效率高、温度均匀性好、设备稳定等特点，广泛应用于金属材料热处理、陶瓷烧结、粉末冶金及电子材料制备等领域，为材料性能提升提供可靠保障。

The vacuum hydrogen furnace is a specialized heat treatment equipment that integrates vacuum and hydrogen atmosphere environment. It eliminates air inside the furnace through a vacuum system and introduces hydrogen gas as a protective or reducing atmosphere. Utilizing efficient heating elements (molybdenum strip heating) and a precise temperature control system, it achieves exact control of temperature and atmosphere. Haoyue Technology's equipment is characterized by strong safety performance, high heating efficiency, good temperature uniformity, and equipment stability. It is widely used in fields such as metal material heat treatment, ceramic sintering, powder metallurgy, and electronic material preparation, providing reliable guarantees for improving material performance.

立式结构 / VERTICAL STRUCTURE

HV65/320正视图

HV65/320 Front View



技术特点 / ADVANTAGES

- 炉体采用立式/卧式结构，柱状结构的炉胆使得气流分布均匀，寿命均一，并且外壳材质采用双层SUS304不锈钢材质；
- 加热元件采用在高温下力学性能优良的钼带，其表面负荷被确定合理的范围内。和炉体采用独家设计结构，传热快，维修更换简便，快捷；
- 升温快：升温速率1~15°C/分钟(≤1300°C)；
- 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
- 本设备具有投资少、运行成本低、安装简单、使用维护方便、安全性能高，调节性能好等特点；
- 安全性高：具有超温超压等故障报警，机械式自动压力保护，动作互锁等功能，设备安全性高；
- The furnace body adopts a vertical/horizontal structure. The columnar design of the furnace liner ensures uniform gas flow distribution and uniform service life. The outer shell is made of double-layer SUS304 stainless steel material.
- The heating element adopts molybdenum strip with excellent mechanical properties at high temperatures. Its surface load is determined within a reasonable range. The furnace body employs proprietary design structure for fast heat transfer, easy maintenance and replacement.
- **Fast Heating Rate:**
Heating rate of 1~15°C/minute (up to 1300°C).
- **Excellent Design Optimization:**
The thermal field of the heating chamber is calculated through thermal state simulation, demonstrating very high temperature uniformity. The heating elements and insulation layer are designed with modular optimization.
- This equipment offers low investment, low operating cost, simple installation, convenient use and maintenance, high safety performance, and excellent control characteristics.
- **Excellent Safety Performance:** Equipped with fault alarms for overtemperature and overpressure conditions, mechanical automatic pressure protection, action interlocking, and other safety functions ensuring high equipment reliability.

应用领域 / APPLICATIONS

用于陶瓷烧结或金属化、钎焊、玻璃零件封接用的金属零件退火和净化等的设备。

主要用于工具钢、模具钢、高速钢、超高强度钢、磁性材料、不锈钢、有色金属等材料在氢气气氛状态下的热处理。

Equipment for annealing and purifying metal parts used in ceramic sintering, metallization, brazing, and glass component sealing.

Primarily used for heat treatment of tool steel, mold steel, high-speed steel, ultra-high strength steel, magnetic materials, stainless steel, and non-ferrous metals under hydrogen atmosphere conditions.

H4MO13正视图

H4MO13 Front View



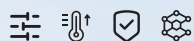
产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	炉膛尺寸(mm) Chamber Size (mm)	加热材质 Heater	取料方式 Loading	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)
HV65/120	立式 Vertical	Φ650×1200	钼带 MO	下取料 Bottom Loading	6.7×10 ⁻¹	1000/1300
HV65/320	立式 Vertical	Φ650×3200	钼带 MO	上取料 Top Loading	6.7×10 ⁻¹	1000/1300
H4MO13	卧式 Horizontal	400×400×600	钼带 MO	侧取料 Side Loading	6.7×10 ⁻¹	1000/1300
H6MO13	卧式 Horizontal	600×600×900	钼带 MO	侧取料 Side Loading	6.7×10 ⁻¹	1000/1300
H7MO13	卧式 Horizontal	700×700×1000	钼带 MO	侧取料 Side Loading	6.7×10 ⁻¹	1000/1300
H8MO13	卧式 Horizontal	800×800×1200	钼带 MO	侧取料 Side Loading	6.7×10 ⁻¹	1000/1300

气压烧结炉(卧式)

Gas Pressure Sintering Furnace (Horizontal)

G Series



温度均匀性好 / 升温速度快 / 安全性能好 / 组织结构可控

Good Temperature Uniformity / Fast Heating Rate /
Excellent Safety Performance / Controllable Microstructure

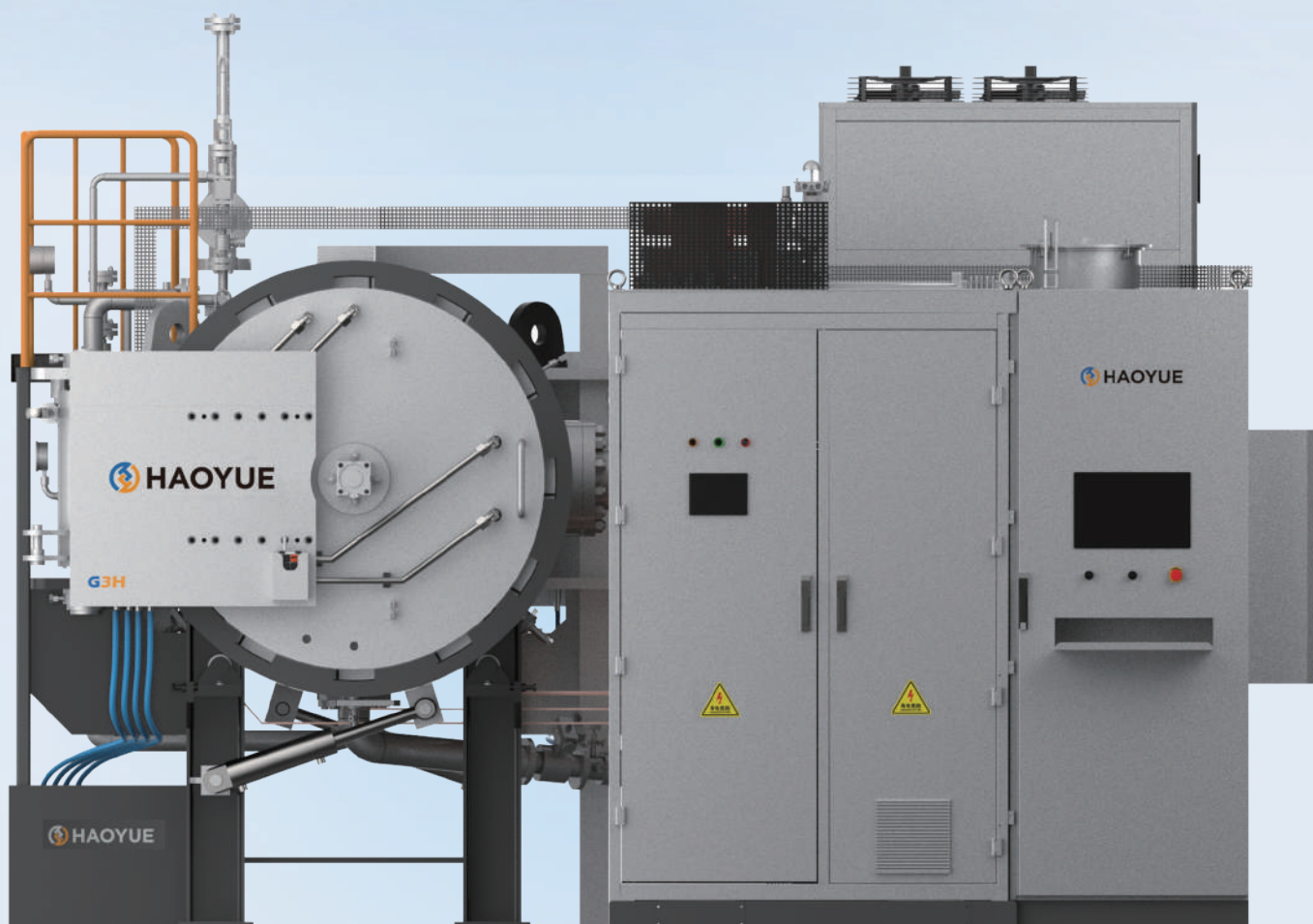
简介 / INTRODUCTION

加压烧结炉系列集正压脱蜡、真空脱蜡、真空烧结、分压烧结、加压烧结、气氛控制、冷却等功能于一体。本产品为周期作业式，适用于氮化硅陶瓷球、陶瓷刀具等材料在高压氮气或氩气气氛内进行烧结，有利于增加材料的烧结密度，提高材料的机械性能。多种装料设计，使装卸与维修工作更为简便。整个工艺过程自动控制。

The pressure sintering furnace series integrates positive pressure dewaxing, vacuum dewaxing, vacuum sintering, partial pressure sintering, pressure sintering, atmosphere control, and cooling functions into a single system. This product is a cycle-operation type, suitable for materials such as silicon nitride ceramic balls and ceramic cutting tools sintering in high-pressure nitrogen or nitrogen atmosphere. This is beneficial for increasing the sintering density of materials and improving their mechanical properties. Multiple loading designs make loading, unloading, and maintenance work more convenient. The entire process is automatically controlled.

G3H正视图

G3H Front View



技术特点 / ADVANTAGES

- 卧式设计，使装卸与维修工作更为简便，整个工艺过程自动控制；
 - 温度均匀性好：采用特殊的炉胆结构和加热器布置，炉温均匀性好；
 - 脱脂效果好：采用特殊结构脱脂箱，密封效果好，脱脂完全对炉内元件无污染；
 - 功能多：具备真空烧结、压力烧结、负压脱脂等功能；
 - 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
 - 安全性高：具有超温超压等故障报警，机械式自动压力保护，动作互锁等功能，设备安全性高；
 - 设备可选择配置脱脂系统，实现陶瓷制品的脱脂烧结一次性处理。
- Horizontal design makes loading, unloading, and maintenance work more convenient; automatic control throughout the entire process.
 - **Good Temperature Uniformity:** Adopts special furnace liner structure and heater arrangement to achieve excellent furnace temperature uniformity.
 - **Good Debinding Effect:** Uses special structure debinding chamber with excellent sealing performance; debinding is complete and causes no contamination to internal furnace components.
 - **Multifunctional:** Equipped with vacuum sintering, pressure sintering, and negative pressure debinding functions.
 - **Good Design Optimization:** The heating chamber thermal field is subject to thermal-state simulation and calculation with very high temperature uniformity; configured heating elements and insulation layer employ modular optimization design.
 - **Excellent Safety Performance:** Equipped with fault alarms for overtemperature and overpressure, mechanical automatic pressure protection, action interlocking, and other safety functions.
 - Equipment can optionally be configured with a debinding system to achieve one-time integrated debinding-sintering treatment of ceramic products.

应用领域 / APPLICATIONS

在高压保护气氛条件下对陶瓷（如碳化硅、氧化锆、氧化铝、氮化硅等）及金属材料（如硬质合金）等进行热等静压烧结处理，同时也适用大专院校、科研单位进行中试批量生产用。适用于氮化硅陶瓷球、陶瓷刀具等材料在高压氮气或氩气气氛内进行烧结。有利于增加材料的烧结密度，提高材料的机械性能。

Under high-pressure protective atmosphere conditions, ceramics (such as silicon carbide, zirconia, alumina, silicon nitride, etc.) and metal materials (such as hard alloys) are subjected to hot isostatic press sintering treatment. Also suitable for pilot-scale batch production in colleges and research institutions. Suitable for sintering materials such as silicon nitride ceramic balls and ceramic cutting tools in high-pressure nitrogen or argon atmosphere. Beneficial for increasing material sintering density and improving material mechanical properties.

G3H等轴测图

G3H Isometric View



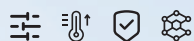
产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	炉膛尺寸(mm) Chamber Size (mm)	加热材质 Heater	取料方式 Loading	最高温度(°C) Max. Temp. (°C)	气体压力(MPa) Gas Pressure (MPa)	极限真空度(Pa) Ultimate Vacuum (Pa)	适用工艺 Applications
G3H	卧式 Horizontal	300×300×1000	石墨 GR	侧取料 Side Loading	1600/2000	6/10	10	烧结/分压烧结/脱脂 Gas Pressure Sintering / Partial Pressure Sintering / Degreasing
G5H	卧式 Horizontal	500×500×1800	石墨 GR	侧取料 Side Loading	1600/2000	6/10	10	烧结/分压烧结/脱脂 Gas Pressure Sintering / Partial Pressure Sintering / Degreasing

气压烧结炉(立式)

Gas Pressure Sintering Furnace (Vertical)

G Series



温度均匀性好 / 升温速度快 / 安全性能好 / 组织结构可控

Good Temperature Uniformity / Fast Heating Rate /

Excellent Safety Performance / Controllable Microstructure

简介 / INTRODUCTION

加压烧结炉系列集正压脱蜡、真空脱蜡、真空烧结、分压烧结、加压烧结、气氛控制、冷却等功能于一体。本产品为周期作业式，适用于氮化硅陶瓷球、陶瓷刀具等材料在高压氮气或氩气气氛内进行烧结，有利于增加材料的烧结密度，提高材料的机械性能。多种装料设计，使装卸与维修工作更为简便。整个工艺过程自动控制。

The gas-pressure sintering furnace series integrates positive-pressure dewaxing, vacuum dewaxing, vacuum sintering, partial-pressure sintering, pressure sintering, atmosphere control, and cooling functions into one complete system. This is a batch-operation furnace suitable for sintering materials such as silicon nitride ceramic balls and ceramic cutting tools in a high-pressure nitrogen or argon atmosphere. This approach increases the sintering density of materials and improves their mechanical properties. Multiple loading designs enable convenient loading, unloading, and maintenance operations. The entire process is automatically controlled.

G5V等轴测图

G5V Isometric View



技术特点 / ADVANTAGES

- 立式设计，使装卸与维修工作更为简便，整个工艺过程自动控制；
 - 温度均匀性好：采用特殊的炉胆结构和加热器布置，炉温均匀性好；
 - 脱脂效果好：采用特殊结构脱脂箱，密封效果好，脱脂完全对炉内元件无污染；
 - 功能多：具备真空烧结、压力烧结、负压脱脂等功能；
 - 设计优化好：加热室热场经热态模拟计算，具有非常高的温度均匀性、配置的加热元件及隔热层采用模块化优化设计；
 - 安全性高：具有超温超压等故障报警，机械式自动压力保护，动作互锁等功能，设备安全性高；
 - 设备可选择配置脱脂系统，实现陶瓷制品的脱脂烧结一次性处理。
- Vertical design simplifies loading, unloading, and maintenance operations. The entire process cycle is controlled automatically.
 - **Good Temperature Uniformity:** Employs a specialized furnace liner structure and optimized heater arrangement to achieve superior temperature uniformity throughout the hot zone.
 - **Excellent Debinding Effect:** Features a specially designed debinding chamber with superior sealing performance. Debinding is complete with no contamination of furnace components.
 - **Multifunctional Capabilities:** Equipped with vacuum sintering, pressure sintering, and negative pressure debinding functions.
 - **Optimized Design:** The heating chamber thermal field has been validated through thermal simulation analysis, providing exceptionally high temperature uniformity. Heating elements and insulation layers are designed with modular optimization for maximum efficiency.
 - **High Safety Level:** Incorporates fault alarms for overtemperature and overpressure conditions, mechanical automatic pressure protection, and interlock functions for comprehensive equipment safety.
 - **Optional Debinding System Configuration:** Enables single-stage debinding and sintering treatment for ceramic components.

应用领域 / APPLICATIONS

在高压保护气氛条件下对陶瓷（如碳化硅、氧化锆、氧化铝、氮化硅等）及金属材料（如硬质合金）等进行热等静压烧结处理，同时也适用大专院校、科研单位进行中试批量生产用。适用于氮化硅陶瓷球、陶瓷刀具等材料在高压氮气或氩气气氛内进行烧结。有利于增加材料的烧结密度，提高材料的机械性能。

Under high-pressure protective atmosphere conditions, this equipment is suitable for hot isostatic press (HIP) sintering of ceramics (such as silicon carbide, zirconia, alumina, silicon nitride, and others) and metal materials (such as hard metal alloys). The equipment is also well-suited for pilot-scale batch production in colleges and research institutions. It is applicable for sintering materials such as silicon nitride ceramic balls and ceramic cutting tools under high-pressure nitrogen or argon atmospheres. This process effectively increases material sintering density and enhances mechanical properties.

G3V等轴测图

G3V Isometric View



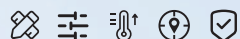
产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	炉膛尺寸(mm) Chamber Size (mm)	加热材质 Heater	取料方式 Loading	最高温度(°C) Max. Temp. (°C)	气体压力(MPa) Gas Pressure (MPa)	极限真空度(Pa) Ultimate Vacuum (Pa)	适用工艺 Applications
G3V	立式 Vertical	Φ350×700	石墨 GR	下取料 Bottom Loading	1600/2000	6/10	10	烧结/分压烧结/脱脂 Gas Pressure Sintering/ Partial Pressure Sintering/Degreasing
G5V	立式 Vertical	Φ500×1000	石墨 GR	下取料 Bottom Loading	1600/2000	6/10	10	烧结/分压烧结/浸渍 Gas Pressure Sintering/ Partial Pressure Sintering/Dipping

热等静压机

Hot Isostatic Pressing

I Series



设计优化好 / 温度均匀性好 / 升温速度快 / 压力精度高 / 安全性能好

Good Design Optimization / Good Temperature Uniformity / Fast Heating Rate /
High Pressure Accuracy / Excellent Safety Performance

简介 / INTRODUCTION

热等静压 (Hot Isostatic Pressing, HIP) 是一种对金属或陶瓷材料的特殊热处理工艺, 是制备高性能材料的重要手段。该工艺技术可用于粉末冶金成型或对成型后的铸件 (钛合金、高温合金、铝合金等疏松缩孔铸件) 进行致密化处理, 利用惰性气体作为传压介质, 相同的压力从各个方向均匀作用于部件表面, 消除产品工艺固有内部缺陷, 例如气孔、内部裂缝、局部疏松等, 从而在提高部件整体力学性能, 尤其是疲劳性能, 同时降低成本, 提高能源效率。经过热等静压处理, 材料的耐磨、耐腐蚀性以及机械性能会获得极大的提升, 疲劳寿命可增加10~100倍。

Hot Isostatic Pressing (HIP) is a specialized heat treatment process for metal and ceramic materials, and an important means for preparing high-performance materials. This process technology can be applied to powder metallurgy forming or densification treatment of formed castings (such as titanium alloys, high-temperature alloys, aluminum alloys, and other porous or shrinkage-cavity castings). Using inert gas as the pressure transfer medium, uniform pressure is applied to the part surface from all directions, eliminating inherent internal defects in the product process, such as porosity, internal cracks, and local looseness. This approach improves the overall mechanical properties of the parts, especially fatigue resistance, while simultaneously reducing costs and improving energy efficiency. After HIP treatment, the material's wear resistance, corrosion resistance, and mechanical properties are greatly enhanced, with fatigue life potentially increased by 10-100 times.

I10MO14等轴测图

I10MO14 Isometric View



技术特点 / ADVANTAGES

用途多样：热等静压粉末冶金、致密化处理、扩散连接。

热等静压粉末冶金：

- 设计灵活：设计成与最终制品几乎相同的形状，减少原料浪费，机加工程序，和运输时间；
- 晶粒细小均匀，具有各向同性的材料性能-耐磨，耐腐蚀，机械性能提升，寿命超长；
- 内部均一致密-超声波检测无影响；
- 不产生液相-最大程度减小偏析，提高材料耐腐蚀性；
- 可以实现两种不同金属材料粉末的制备 - 双金属仍可进行后续的锻造及挤压等加工。

致密化处理：

- 内部缺陷消除：消除缩松、缩孔、偏析；
- 大幅提升疲劳寿命：10~100倍；
- 提升延展性和断裂韧性；
- 制品可达到理论密度；
- 耐磨，耐腐蚀性极大提高；
- 消除材料内部应力。

扩散连接：

- 可以连接接触面具有复杂形状的零件，并实现严格的尺寸控制；
- 可在一道工序中连接多个同类或异类材料；
- 可快速实现大面积的连接；
- 可使采用常规焊接方法无法连接的脆性金属，或熔点相差较大的金属，实现固态连接；
- 由于作用在零件上的等静压力高且均匀因此减少及消除了在连接区外侧的微气孔或裂纹；
- 无传统焊接工艺中产生的焊缝、热影响区、表面气孔、夹杂、咬边、裂纹等缺陷。

Versatile Uses:

HIP: Powder metallurgy, densification, diffusion bonding.

HIP Powder Metallurgy:

- **Design Flexibility:** Design to nearly the same shape as the final product, reducing raw material waste, machining procedures, and transportation time. Fine grain structure with isotropic properties and extended service life.
- Internal uniform density with no impact on ultrasonic inspection.
- No liquid phase generated—minimizes segregation to the maximum extent and improves material corrosion resistance.
- Can prepare ingot blanks from two different metallic materials—bimetal can still undergo subsequent forging and extrusion processing.

Densification Treatment:

- Elimination of internal defects: shrinkage porosity, shrinkage cavities, and segregation eliminated.
- Greatly improves fatigue life by 10 to 100 times.
- Improved ductility and fracture toughness.
- Products can reach theoretical density.
- Wear resistance and corrosion resistance greatly improved.
- Eliminates internal stresses in the material.

Diffusion Bonding:

- Connects parts with complex contact surfaces and achieves strict dimensional control.
- Joins multiple homogeneous or dissimilar materials in a single process.
- Rapidly achieves large-area connections.
- Enables solid-state connections for brittle metals that cannot be joined by conventional welding methods, and for metals with large melting point differences.
- High and uniform isostatic pressure reduces and eliminates microscopic porosity or cracks on the outer edge of the connection zone.
- Produces no defects such as welds, heat-affected zones, surface porosity, inclusions, undercuts, cracks, or other defects generated in traditional welding processes.

应用领域 / APPLICATIONS

高温合金、钛合金、铝合金、铜合金、难熔金属、硬质合金、不锈钢、耐腐蚀合金，陶瓷、复合材料、电子材料、功能材料等。

High-temperature alloys, titanium alloys, aluminum alloys, copper alloys, refractory metals, cemented carbides, stainless steel, corrosion-resistant alloys, ceramics, composite materials, electronic materials, functional materials, and more.

I5CC20等轴测图
I5CC20 Isometric View



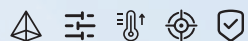
产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	设备形式 Structure	炉膛尺寸(mm) Chamber Size (mm)	加热材质 Heater	取料方式 Loading	最高温度(°C) Max. Temp. (°C)	气体压力(MPa) Gas Pressure (MPa)	真空度(Pa) Ultimate Vacuum (Pa)	适用工艺 Applications
I5CC20	立式 Vertical	Φ500×1000	碳碳 C/C	上取料 Top Loading	2000	100/150/200	100	热等静压烧结 Hot Isostatic Sintering
I10MO14	立式 Vertical	Φ1000×2000	钼带 MO	上取料 Top Loading	1400	100/150/200	100	热等静压烧结 Hot Isostatic Sintering

气相沉积炉(CVD/CVI)

Chemical Vapor Deposition Furnace (CVD/CVI)

C Series



设备稳定性高 / 温度均匀性好 / 升温速度快 / 控制精度高 / 安全性能好

High Equipment Stability / Good Temperature Uniformity / Fast Heating Rate /

High Control Accuracy / Excellent Safety Performance

C8VGR16等轴测图

C8VGR16 Isometric View



简介 / INTRODUCTION

热诱导化学气相沉积 (英语:chemical vapor deposition ,CVD)是用于各种电介质,半导体和金属材料的保护涂层的沉积的有力方式,无论是单晶,多晶,无定形或外延状态上大或小的形态。典型的涂层材料包括热解碳,碳化硅,氮化硼。通过使用合成前体,涂层非常纯净并满足半导体工业的典型要求,根据工艺参数,可以有多种层厚度,从单个或几个原子层到厚度从10纳米到数百微米的固体保护层或功能层,以及厚度达100微米的单片部件,甚至高达数毫米。

热诱导的化学气相渗透 (英语:Chemical Vapor Infiltration ,CVI) 是一个与CVD有关的技术,以在基体材料渗入多孔或纤维预成型件以制备由复合材料制成的部件具有改善的机械性能,耐腐蚀性,耐热冲击性和低残余应力。

Thermal-induced chemical vapor deposition (CVD) is a powerful method for depositing protective coatings on various dielectrics, semiconductors, and metal materials in single crystal, polycrystalline, amorphous, or epitaxial states, in large or small forms. Typical coating materials include pyrolytic carbon, silicon carbide, and boron nitride. By using synthetic precursors, the coatings are highly pure and meet the typical requirements of the semiconductor industry. Depending on process parameters, multiple layer thicknesses are achievable, ranging from single or several atomic layers to solid protective or functional layers with thicknesses from 10 nanometers to hundreds of micrometers, as well as monolithic components with thicknesses up to 100 micrometers and even several millimeters.

Thermal-induced chemical vapor infiltration (CVI) is a technique related to CVD that infiltrates porous or fiber preforms into a matrix material to prepare composite components with improved mechanical properties, corrosion resistance, heat shock resistance, and low residual stress.

应用领域 / APPLICATIONS

化学气相沉积炉 (碳化硅) 可用于以硅烷为气源的材料表面抗氧化涂层、基体改性等。立式化学气相沉积炉 (沉积炭) 可用于以碳氢气体 (如C₃H₈、CH₄等) 为碳源的材料表面或基体等温CVD/CVI处理。

立式化学气相沉积炉 (SiC、BN) 可用于材料的表面涂层、基体改性、复合材料制备等外延片基座、晶体炉高温耐材、热弯模具、半导体坩埚、陶瓷基复合材料等。

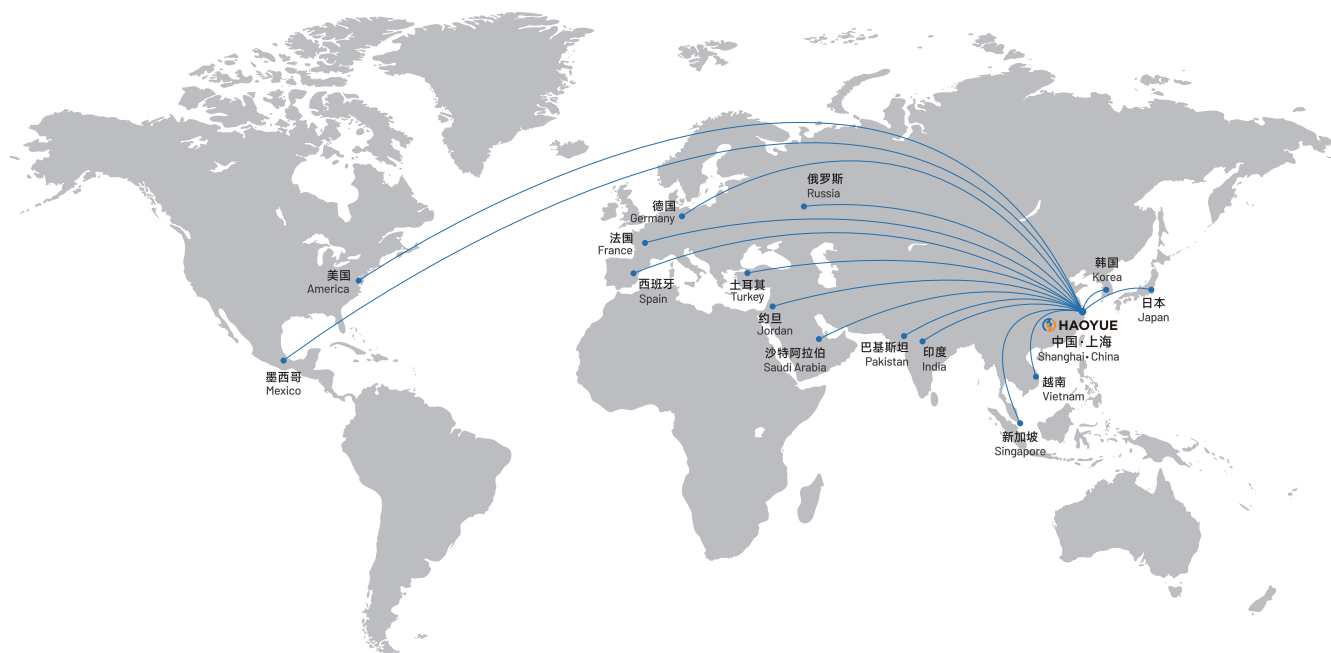
技术特点 / ADVANTAGES

- 采用立式、底/顶开门结构: 装、卸料精度高, 操作方便;
 - 采用先进的控制技术, 能精密控制MTS的流量和压力, 炉膛内沉积气流稳定, 压力波动范围小;
 - 温度均匀性好: 平均温度均匀性为±5°C;
 - 采用多通道沉积气路, 流场均匀, 无沉积死角, 沉积效果好;
 - 全封闭沉积室, 密封效果好, 抗污染能力强;
 - 安全性能好: 采用工控机+PLC+PID程序控温, 安全可靠;
 - 对沉积产生的高腐蚀性尾气、易燃易爆气体、固体粉尘及低熔点粘性产物能进行有效处理;
 - 多级高效尾气处理系统, 环境友好, 能高效收集焦油及副产物, 易清理;
 - 采用设计防腐蚀真空机组, 持续工作长时间, 维修率极低。
- **Vertical Design With Bottom/Top Door-opening Structure:** High loading and unloading precision, easy operation.
 - **Advanced Control Technology:** Precise control of MTS flow and pressure; stable deposition airflow in the furnace chamber with minimal pressure fluctuation range
 - **Excellent Temperature Uniformity:** Average temperature uniformity of ±5°C.
 - **Multi-channel Deposition Gas Path:** Uniform flow field, no deposition dead zones, superior deposition performance.
 - **Fully Enclosed Deposition Chamber:** Excellent sealing effect, strong contamination resistance.
 - **Excellent Safety Performance:** Programmable temperature control using industrial control computer + PLC + PID ensures safe and reliable operation.
 - Effective treatment of highly corrosive exhaust gas, flammable and explosive gases, solid dust, and low melting point viscous products generated during deposition.
 - **Multi-stage Efficient Exhaust Gas Treatment System:** Environmentally friendly, efficient collection of tar and byproducts, easy to clean.
 - **Corrosion-resistant Vacuum Unit Design:** Long continuous working time, extremely low maintenance rate.

Chemical vapor deposition furnaces (silicon carbide) can be used for surface oxidation-resistant coatings and matrix modification of materials using silane as the gas source. Vertical chemical vapor deposition furnaces (pyrolytic carbon) can be used for isothermal CVD/CVI treatment of material surfaces or substrates using hydrocarbon gases (such as C₃H₈, CH₄, etc.) as carbon sources. Vertical chemical vapor deposition furnaces (SiC, BN) can be used for surface coating, matrix modification, and composite material preparation, including substrates for epitaxial wafers, high-temperature refractory materials for crystal furnaces, hot-bending molds, semiconductor crucibles, and ceramic-matrix composite materials.

产品规格及技术指标 / SPECIFICATIONS & PARAMETERS

产品型号 Model	炉膛尺寸(mm) Chamber Size (mm)	极限真空度(Pa) Ultimate Vacuum (Pa)	最高温度(°C) Max. Temp. (°C)	适用工艺 Applications
C4VGR16	Φ500×600	5	1600	CVD/CVI
C6VGR16	Φ800×900	5	1600	CVD/CVI
C7VGR16	Φ1000×1000	5	1600	CVD/CVI
C8VGR16	Φ1100×1200	5	1600	CVD/CVI



江苏皓越真空设备有限公司

JIANGSU HAOYUE TECHNOLOGY CO.,LTD.

研发中心：上海市嘉定区嘉松北路7301号B2栋

R&D Center: Building B2, No. 7301, Jiasong North Road, Jiading District, Shanghai, China

制造基地：江苏省南通市通州区金渡路111号东久智造园D6

Manufacturing Base: D6, Dongjiu Intelligent Manufacturing Park, 111 Jindu Road, Tongzhou, Nantong, Jiangsu, China

电话 (Tel): 86-21-51095287 传真 (Fax): 86-21-51095281

网址 (Web): www.haoyue-group.cn 邮箱 (E-mail): sale@haoyue-group.com



官方公众号



官方视频号



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