SPS Spark Plasma Sintering Furnace

Category: **SPS Furnace**

Tags: PAS Plasma Activated Sintering, Pulsed Electric Current Sintering, Electric Pulse Assisted Consolidation, PAS Plasma Activated Sintering, Pulsed Electric Current Sintering, Electric Pulse Assisted Consolidation

Spark plasma sintering furnace (also called FAST Field assisted sintering technique or DCS Direct Current Sintering press furnace systems)is an advanced pressure sintering technology that utilizes the instantaneous high temperature, surface activation, discharge impact pressure and other effects generated by pulse discharge excitation plasma to realize rapid sintering of powder. SPS integrates plasma activation, hot pressing, and resistance heating. It has outstanding advantages such as fast heating speed, short sintering time, controllable structure, energy saving and environmental protection, and has important application potential in the preparation of high-performance materials.

Spark plasma sintering furnace introduction:

It is a pressure sintering method that uses on-off DC pulse current to directly energize and sinter. The main function of on-off DC pulse current is to generate discharge plasma, discharge impact pressure, Joule heat and electric field diffusion. The SPS device mainly includes the following parts: axial pressure device; water-cooled punch electrode; vacuum chamber; atmosphere control system (vacuum, argon); DC pulse power supply and cooling water, displacement measurement, temperature measurement and safety control units.

Application field:

Spark plasma sintering is suitable for almost all types of materials such as metals, ceramics, and composite materials, and is of great significance for the realization of high-quality, high-efficiency, low-cost and low-cost material preparation. In addition, spark plasma sintering equipment is not limited to sintering applications of materials, but can also be used for joining, forming, surface modification, etc.

intermetallic compound	Metal	Cermet	ceramics					other materials
			oxide ceramics	carbide ceramics	Nitride ceramics	boride ceramics	Fluoride Ceramics	
TiAl, MoSi2, NbAl, NiAl, NbCo, Si3Zr5, etc.	Fe, Cu, Al, Au, Cr, Mo, Sn, Ti, W	Si3N4+Ni, Al2O3+TiC, WC+Co+Fe, Al2O3+Ni, ZrO2+Ni, etc.	Al2O3, ZrO2, MgO, SiO2, TiO2, etc.	SiC, B4C, TiC, WC, ZrC, VC, etc.	Si3N4, TaN, TiN, AlN, ZrN, VN, etc.	TiB2, HfB2, VB2, ZrB2, LaB6, etc.	LiF, MgF2, CaF2, etc.	Organic materials, composite materials, etc.

Features of Spark plasma sintering furnace:

- Rapid sintering: the heating rate can reach above 500℃/min. The sintering time is significantly shorter than traditional sintering methods such as hot pressing, HIP, and pressureless sintering.
- Purification & activation sintering: particle surface purification effect (removal of adsorbed gas & oxide film) and particle surface activation effect to achieve sintering of difficult-to-sinter materials
- Fine-grain sintering: rapid temperature rise inhibits grain growth, regulates the microstructure and prepares the required sintered body (one of the best ways to prepare nanocrystalline materials)
- Wide range temperature sintering: the sintering temperature covers the high temperature range from low temperature to 2300 °C
- Density control sintering: From porous body to dense sintered body, density control is free and easy
- Temperature gradient sintering: Create a temperature gradient (hundreds of ℃/mm) in the mold to achieve simultaneous sintering of materials with different melting points (one of the best ways to prepare functionally graded materials)

Technical Parameters:

Model	CNEQPS-SPS-2T 2KA	CNEQPS-SPS-3T 3KA	CNEQPS-SPS-5 T5KA	CNEQPS-SPS-1 0T6KA	CNEQPS-SPS-20 T10KA	CNEQPS-SPS-5 0T30KA
Rated Pressure	20KN	30KN	50KN	100KN	200KN	500KN
Max. Output Current	2000A	3000A	5000A	6000A	10000A	30000A
Max. Output Voltage	10V	10V	10V	10V	10V	10V
Rated Power	20KW	30KW	50KW	60KW	100KW	300KW
Sample Size	Φ20mm	Φ30mm	Φ30mm	Φ50mm	Φ100mm	Φ200mm
Max. Temperature	2300℃	2300℃	2300℃	2300℃	2300℃	2300℃
Head stroke	60mm	60mm	100mm	100mm	100mm	200mm
Limited Vacuum	Low vacuum mode ≤10Pa (mechanical pump) High vacuum mode ≤6*10-3Pa (optional mechanical pump + molecular pump)					
Temperature Measurement	Infrared temperature measurement (temperature measurement range 250°C-2500°C), thermocouple temperature measurement (temperature measurement range 0°C-1200°C)					
Electronic Control System	Touch screen + PLC Equipped with complete control system and data analysis system, to realize the monitoring and analysis of pressure, temperature, current and other parameters					

Note: The product can be customized and developed