Spark Plasma Sintering Furnace (SPS)
(+2300°C)

Serving the Scientific, Medical and Research industries since 1945

LABEC introduces **Spark Plasma Sintering Furnace (SPS),** a revolutionary high speed powder consolidation process.

SPS rapid pressure sintering system is one of world's most advance hot press sintering systems. It has characteristics of fast sintering, high density and is the good tool for sintering nano-phase materials, rare earth permanent magnetic materials, glass, non-equilibrium alloy materials and biological materials.

Characteristics: fast sintering, good energy-saving, high efficiency

SPS Advantages

- Feasibility to consolidate difficult to press powder and non-equilibrium compositions.
- Full density in short time.
- Higher sintered densities at low temperatures.
- Finer microstructure and improved physio-mechanical properties (due to clean grain boundaries and control over grain growth).
- Uniform and homogenous densities and properties.

LABEC
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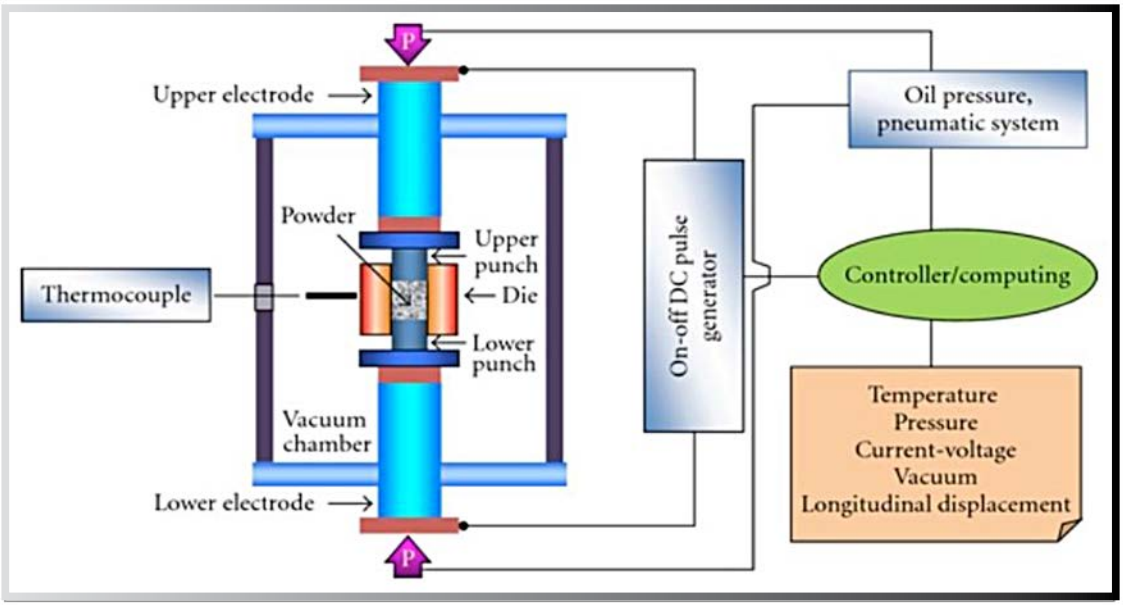

Mechanism of SPS

- Three mechanisms contribute to field assisted sintering.
- Activation of powder particles by pulsed current.
- Resistance heating and pressure application.
- Activation results inn clean grain boundaries; direct grain-to-grain contact, enhanced grain boundary diffusion.
- Pulse discharge by applying on/off voltage (~3V) and high current (< 5000 A). Pulse duration a few ms.
- Pressure applied at constant/variable level.
- Sintering temperatures low to over 2000°C.
- Sintering completed in short periods of ~5-20 minutes.

Application Materials

Metal: Fe, Cu, Al, Au, Ag, Ni, Cr, Mo, Sn, Ti, W, Be.
Ceramics Oxide: Al2O3, Mulite, ZrO2, MgO, SiO2, TiO2, HfO2.
Carbide: SiC, B4C, TaC, WC, ZrC, VC.
Nitride: Si3N4, TaN, TiN, AlN, ZrN, VN.
Boride: TiB2, HfB2, LaB6, ZrB2, VB2.
Fluoride: LiF, CaF2, MgF2.
Cermet: Si3N4+Ni, Al2O3+Ni, ZrO2+Ni, Al2O3+Ti, SUS+WC/Co, BN+Fe, WC+Co+Fe.
Intermetallic Compound: TiAl, MoSi2, Si3Zr5, NiAl, NbCo, NbAl, LaBaCuSO4, Sm2Co17.

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SPECIFICATIONS

Spark Plasma Sintering Furnace (SPS) *(+2300°C)*

Model	Rated Power	Output Current	Input Voltage	Rated working temperature	Maximum pressure	Sample Size	Ram Stroke	Ultimate Vacuum
EF-SPS-10T	50 KW	0-5000A	0-10V	2300°C	10T	Ø50	100mm	10Pa
EF-SPS-20T	100 KW	0-10000A	0-10V	2300°C	20T	Ø100	100mm	10^{-3}Pa

Equipment Details

- **Structure:** Dual layer water cooled with full stainless steel.
- Thermocouple and 2 Raytek Infrared Instruments, USA (temp Control).
- **Vacuum systems:** Beiyi Woosung TRP-60 pump (Korea), vacuum gauge, solenoid charging valve, deflation valve.
- **Power:** Pulse DC, IGBTs, V-I feedback controls.
- **Hydraulic system:** hydraulic pump, pressure regulating valve, pressure transducer, throttle.
- **Water cooling systems:** advanced valves and pipelines, automatic cut-off power to heater if water is cut down, alarm systems.
- **Temperature control system:** fully automated, OMRON PLC, Eurotherm 3000 controllers.
- **Graphite mould:** 1 set provided with the equipment.

Spark Plasma Sintering Furnace in operation.

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