

# Spark Plasma Sintering (SPS)

Vacuum technology introduces a revolutionary high speed powder consolidation technology known as Spark Plasma Sintering.

SPS utilizes high amperage DC pulse current to rapidly and evenly disperse spark plasma energy between particles. A SPS system can process conductive, non-conductive and composite materials to any level of density, including full density, with high homogeneity and especially strong bonds between particles. SPS can make new materials, such as ceramic-carbon nanotube composites, multifunctional ceramic composites, metastable composites containing nonequilibrium phases, materials that combine different phases that would not normally coexist. SPS is also able to produce highly textured dense ceramics.

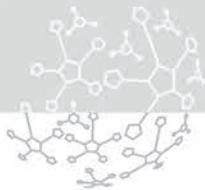


## Application

### SPS Technology Benefits:

- Fast cycle times
- Pre-forming and binders are not necessary
- Uniform sintering of similar and dissimilar materials
- Vaporization of pre-existing contamination
- Ease of use
- Full density and controlled porosity
- Low operating costs
- Powder-to-part net and near-net shapes
- Minimal grain growth
- Extremely profitable and versatile metallurgical process
- Enables the production of objects with a specific shape
- Possibility to obtain special alloys with excellent properties
- High melting point materials (Teflon and tungsten) can be processed

- Ceramic Applications
- Synthesis of FGMs
- Materials for Electronic Applications
- Compacting Nano phase Materials
- Corrosion-Resistant, Wear-Resistant WC/Co Tools
- Diamond Grinding Tools
- Research Institutes, Nuclear Power plant, Metallurgical Departments
- Forming
- Surface Modification
- Synthesizing



Specification				
Models		Nanozint2	Naozint10	Nanozint10I
Capacity (ton-force)		2	10	10
Furnace	Working temperature	up to 1600 °C	up to 2500 °C	up to 2500 °C Hybrid induction system
	Range of temperature	Adjustable up to 2500°C manually and programmable with PC		
	Heating rate	variable up to 1000 oC/min.		
	Temperature measurement system	T < 800°C: Automatic feeder thermocouples 800°C < T < 2500 °C: Axial pyrometer		
	Pulse duration	Programmable within 1-780 ms.		
Vacuum pumping system	Ultimate vacuum level	5x10 <sup>-2</sup> mbar		
	Chamber leak rate	< 5x10 <sup>-3</sup> mbar-liters/second		
	Rotary Pumps	Two stage rotary vane type		
Pressing system	Controlling system	Servo-hydraulically controlled with overall force of 2 and 10 Ton-force or equivalent.		
	Rams (punches/pistons)	Water cooled to withstand the sintering temperature up to 2300°C.		
	Ram movement monitoring	Manually as well as through programmable software using PC for setting at a desired force value.		
Furnace cum pressing chamber	Stainless steel chamber. Water cooled double walled vacuum vessel Front loading type. Ports for viewing and placing pyrometer. Inert gas inlet and air admittance. Process gases: Ar/N <sub>2</sub> (and others, on request) Glass window for positioning lamp from outside of the chamber			