



Technologies to Products...On the Leading Edge

# NanOxide™ HPS-2000

## ≤200nm Strontium Titanate

HPS-2000 has a particle size of 200 nanometer (nm) or below, and is formulated high purity strontium titanate ( $\text{SrTiO}_3$ ) powder designed to meet demanding electronic and mechanical applications. TPL, Inc.'s HPS-2000 series of strontium titanate powders are hydro-thermally formed to achieve particle size and surface areas tailored for the application. Standard sizes are <100 nm, 200 nm and 400 nm. These represent some of the smallest commercial strontium titanate powders available.

HPS-2000 is readily dispersible in aqueous and non-aqueous solvents with appropriate surfactants which are available from TPL, Inc. if necessary.

## Typical Properties

Specific Surface Area (BET)	4.5-12.5 m <sup>2</sup> /g
Nominal Size	200 nm
Loss on Ignition (TGA)	<1.5%
Suspension pH (ASTM - D1208)	9.0-12.0

## Applications

Applications include high voltage capacitor press and fire dielectric systems, voltage tunable microwave devices, and as a curie peak shifter in other high dielectric constant ceramic applications.

# Processing

When introducing HPS-2000 into your process, please keep the following points in mind:

- The manufacturing process for strontium titanate includes a drying step which can induce soft agglomeration (roughly 75 micron size particles). These agglomerates are easily broken up by ultrasonication or ball milling.
- Some harder agglomerates will also exist in the powder comprising several to tens of particles. Because of the extremely fine particle size, these agglomerates require more energy than is traditionally required for larger, micron sized particles. When switching from micron sized powder to nano-sized powder it may be necessary to lengthen ball milling time by a factor of two or three.
- Because of the extremely high surface area, higher surfactant concentrations are typically necessary to disperse nano-sized strontium titanate relative to micron sized powder.

TPL, Inc. markets a formulated dispersing agent, NanoSpense™ 484, specifically designed to enhance dispersion of NanOxide™ ceramic powders in both aqueous and organic solvents.

TPL, Inc. has considerable experience with slurry production, tape cast compositions, composite formulations, dry pressing and firing operations and can assist in determining a process for your application.

**For more information, contact:**

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**Important Notice**

Typical properties should not be construed as a specification. Before using this product you must evaluate it and determine its suitability for your intended application.

**Warranty; Limited Remedy; Limited Liability**

This product will be free from defects in the materials and manufacture as of the date of purchase. **TPL MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE.** If this product is defective, your exclusive remedy shall be, at TPL's option, to replace or repair or refund the purchase price of the TPL product. Except where prohibited by law, TPL will not be liable for any incidental loss or damage arising from the use of this product.