



Technologies to Products...On the Leading Edge

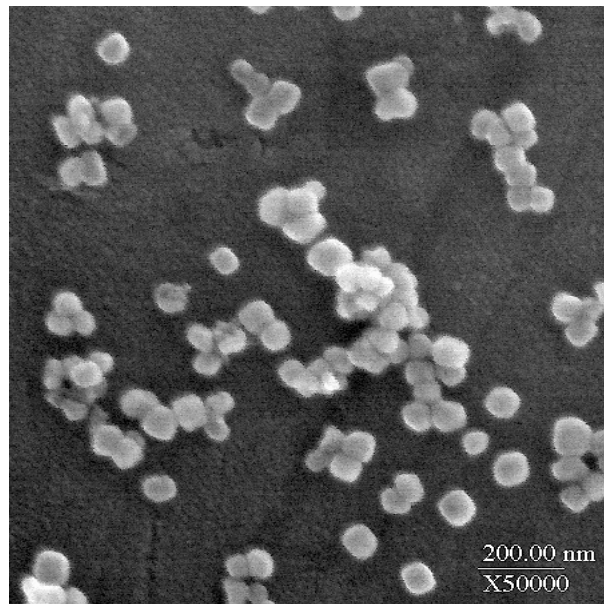
NanOxide™ HBS-1000

<100nm Barium-Strontium Titanate

HBS-1000 is a formulated high purity barium-strontium titanate nano-sized powder designed to meet demanding electronics applications. HBS-1000 Ba /Sr ratios of 80:20 and 50:50 are standard and are currently available from inventory. HBS-1000 is the smallest commercially available barium-strontium titanate powder on the market at 50 nanometers (nm). It 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 | 15-18 m ² /g |
| Nominal Size | 50 nm (BET) |
| Loss On Ignition | <1.5% |
| PH (ASTM - D1208) | 9.0-11.0 |
| Chemical Analysis | |
| Ba + Sr:Ti (XRF) | 0.995-1.010 |
| SrO (ICP) | <0.1% |
| CaO (ICP) | <10 ppm |
| MgO (ICP) | <10 ppm |
| SiO ₂ (ICP) | <200 ppm |
| Al ₂ O ₃ (ICP) | <100 ppm |
| Fe ₂ O ₃ (ICP) | <10 ppm |
| (Ba + Sr)TiO ₃ | > 99.5% |



Applications

HBS-1000 has been successfully used in multilayer ceramic capacitors (MLCC), monolithic ceramic capacitors, and polymer composites. Barium-Strontium titanate thin films and composites are finding application into a wide range of broadband RF and microwave devices such as tunable filters, phase shift devices, electromagnetic absorbers and antennas.

Processing

When introducing HBS-1000 into your process, please keep the following points in mind:

- The manufacturing process for barium 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 can 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 barium titanate relative to micron sized powder.

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:
Trista Mosman
Director of Admin and Marketing
TPL, Inc.
3921 Academy Parkway North, NE
Albuquerque, NM 87109
Phone: (505) 342-4439
Fax: (505) 343-1797
tmosman@tplinc.com

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.