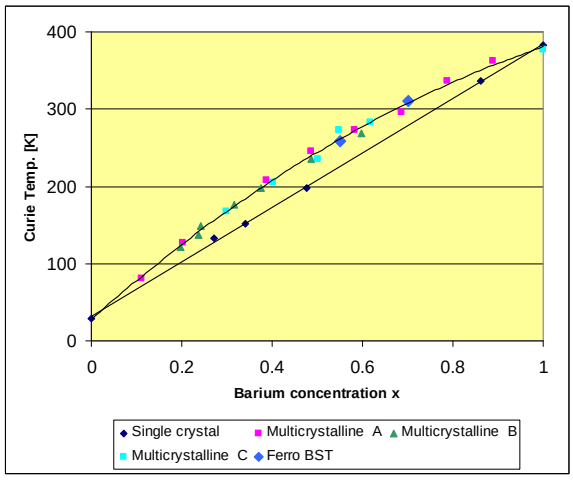
FERRO
ELECTRONIC MATERIAL SYSTEMS

Additive materials

Barium Strontium Titanate (BST)
Additive/Dielectric Material

Description: BST (Barium Strontium Titanate) is a multi-component single phase material with a Curie peak that can be moved by modifying the barium to strontium ratio. These different ratios allow a wide variation of properties for applications like:

- Filled polymers
- Microwave components
- Implanted medical devices
- Aerospace components
- Standard capacitors



Curie temperature of Ferro BSTs with different $Ba_XSr_{1-X}TiO_3$ (from literature).

Processing Information for Fired Applications:

Firing temperature	1340°C for 2 hours
Setter selection	Zirconia
Composition	Pb and Cd Free

Typical Physical Properties:

For $Ba_{0.55}Sr_{0.45}TiO_3$

Particle Size (µm)	
D10 (Horiba)	0.66
D50 (Horiba)	1.44
D90 (Horiba)	3.81
Surface area (m^2/g)	1.87

These properties can be manipulated to make the powder coarser or finer depending on customer requirements. The (Ba/Sr)/Ti ratio can be fine tuned to offer optimum performance in the respective application as well.

Typical Electrical Properties:

For $Ba_{0.55}Sr_{0.45}TiO_3$, based on Ferro fired disc measurements.

Dielectric Constant, K (@ 25°C, 1 kHz)	2367
DF (%) @ 1 kHz	0.19
DF (%) @ 1 MHz	0.09
Curie Point (°C)	-15
K @ Curie Point	5717
DF 1 kHz @ Currie Point	0

Ba/Sr mole ratio	Ba55/Sr45	Ba70/Sr30	Ba70/Sr30
(Ba+Sr)/Ti mole ratio	0.990	1.000	0.998
D10 [µm]	0.66	0.36	1.02
D50 [µm]	1.44	0.59	2.65
D90 [µm]	3.81	1.10	4.92
SSA [m²/g]	1.87	6.39	1.17
K at 10% in PC	85	81	95
K dispersed BST	1131	707	3499

Properties of experimental BST powders

The numbers shown for 10% dispersion in 90% propylenecarbonate (PC, K=64) are measured with a HP fluid cell and an Agilent 4284A impedance analyzer at 1 MHz. K of the dispersed particles is calculated according to the original Lichtenecker formula:

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$$\log K = v_1 \log K_1 + v_2 \log K_2$$

where v_1 and v_2 = PC and BST volume fractions and K_1 and K_2 = PC and BST K values.

BST shows promise in a number of potential applications ranging from filled polymer to targeted fired medical applications. A number of advantages of this material are observed because it is a single phase material that offers properties beyond the mixing of various barium and strontium titanates. These translate into potential unique application areas especially for high frequency applications.

Storage: Store at room temperature in original, unopened containers. When properly stored, unopened material will have a shelf life of 5 years.

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