Materials Sciences ▪ Ceramics, Refractories and Glass

Barium Strontium Titanate and Non-Ferroelectric Oxide Ceramic Composites for Use in Phased Array Antennas

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Abstract: A ceramic ferroelectric phase shifting device has been demonstrated using Ba(l-x) Sr(x)TiO3 (BSTO) ceramics. As part of an effort to optimize the electronic device performance in the phase shifter, various composites of BSTO combined with other nonelectrically active oxide ceramics have been formulated. In general the composites have reduced dielectric constants, Epsilon,' where epsilon = epsilon'-i epsilon' and loss tangents tan delta. The low dielectric constant and low loss tangent reduce the overall impedance mismatch and insertion loss of the device. In addition, the overall tunability, change in the dielectric constant with applied voltage, is maintained at a relatively high level (15% with an applied electric field of 1.5 V/microns) for dielectric constants of 200. The combination of electronic properties of these materials offer substantially higher operating frequencies, 10 GHz and above. The microstructures including grain size and phase analysis have been examined using SEM and EDX. X-ray diffraction has been used to identify compositions of any secondary phases formed in the composites. The analysis of the phase formation and compositional variations will be related to the electronic properties of the materials. Ferroelectric, Phase shifter, Ceramic composite, Phased array antennas, **Barium** strontium titanate.

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