Microwave Dielectric Response of $(Sr_{1-x}Pb_x)TiO_3$ Based Ferroelectric Ceramics

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Keywords: microwave dielectrics, frequency agile materials, ferroelectric-nonferroelectric composites

There is a growing interest in the microwave dielectrics for the tunable and frequency agile applications. For wireless communication technology the operational frequency lies in the gigahertz region. Nevertheless, only a few studies focusing on the high frequency dielectric properties of ferroelectrics have been reported, probably due to the difficulties of measuring high dielectric constant materials in the microwave range. This paper reports the results of measurements on the dielectric properties of the strontium lead titanate ferroelectric composites (i.e. non-ferroelectric magnesium oxide, MgO, added to the $Sr_{0.80}Pb_{0.20}TiO_3$, SPT, matrix) as a function of temperature over a wide frequency range from 0.05-2GHz. The measurements were made by the reflectometry method using an experimental assembly that included a network analyzer (Hewlett-Packard 8719C) connected to an special sample holder, in which the sample was held under a controlled pressure to avoid the poor contacts due to the thermal contraction or expansion of the sample. The results showed that SPT-MgO composites have a strong dielectric dispersion (around 500MHz) for the temperature range of 100K-280K. On the other hand, at room temperature a suppression of such relaxation was observed with low dielectric loss factors ~ $5x10^{-4}$ over the entire range of frequency from 0.05-2GHz. Such results evidence the potential use of SPT-MgO composites for room temperature tunable microwave applications.