

Sintering of High K LTCC Compatible Dielectrics

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Abstract

The development of microwave electronic devices (telecommunications, radar or medical applications) demands high-permittivity materials with low loss and low sintering temperature since the major concerns are miniaturization and cost reduction. New dielectric materials based on $\text{Ag}(\text{Nb}_x\text{Ta}_{1-x})\text{O}_3$ solid solution (ANT) with sintering aids meet the majority of technical requirements because of their high permittivity and moderate dielectric losses. Moreover, the sintering temperature can be lowered to 900°C thanks to copper addition without modifying dielectric properties thus allowing co-firing with silver.

This study deals with the co-sintering of copper added ANT with silver. ANT formulations with $x = 1/2$ were prepared and then tape-casted. Green ANT tapes were stacked with low K LTCC commercial tapes, based on alumina. The resulting multilayers were co-fired between 850 and 900°C, with and without screen-printed inner silver films. Phase identification was investigated by XRD. Chemical analysis using SEM and Energy-Dispersive Spectroscopy was performed to examine the interdiffusion layers. Permittivity and dielectric losses were measured from 40 Hz to 2 GHz for both ANT alone and ANT co-sintered with silver and/or alumina.