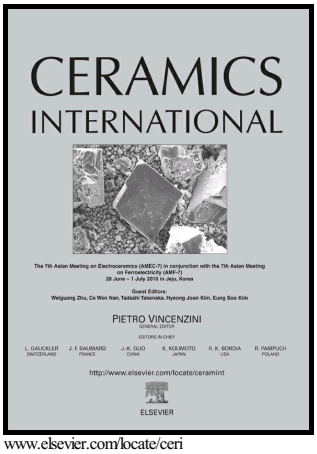

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Abstract

In this work, $25.6BaO\text{-}6.4K_2O\text{-}32Nb_2O_5\text{-}36SiO_2\text{-}xTiO_2$ ($0 \leq x \leq 10$ mol.%) (BKNST) glass ceramics were synthesized by conventional melts and controllable crystallization method. The effects of different TiO_2 addition on the phase composition, dielectric and energy storage properties of BKNS glass ceramics were systematically evaluated. With the TiO_2 concentration increasing, a growing content of Ba_2TiO_4 phase was observed in the glass ceramics. The microstructures appeared to be homogenous and uniform with very low porosity through the addition of TiO_2, for which the maximal breakdown strength of 2112 kV/cm and the corresponding energy storage density of 9.48 J/cm^3 were obtained with x = 7.5. The extremely low dielectric loss of less than 1‰ (25 ^{o}C, 100 kHz) and the obviously improved microstructure contributed to the increased breakdown strength. In addition, the discharge power density of the glass-ceramic capacitor (x = 7.5) was investigated using the RLC charge-discharge circuit and a relatively high value of 16 MW/cm^3 at 300 kV/cm was obtained.

Key words: Glass ceramics, Breakdown strength, Energy-storage density, Discharge