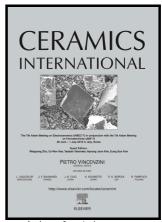
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ACCEPTED MANUSCRIPT

Effects of TiO₂ addition on dielectric and energy storage properties of

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Abstract

In this work, $25.6BaO-6.4K_2O-32Nb_2O_5-36SiO_2-xTiO_2$ (0 \leq x \leq 10 mol.%)

(BKNST) glass ceramics were synthesized by conventional melts and controllable

crystallization method. The effects of different TiO₂ addition on the phase

composition, dielectric and energy storage properties of BKNS glass ceramics were

systematically evaluated. With the TiO₂ concentration increasing, a growing content

of Ba₂TiO₄ phase was observed in the glass ceramics. The microstructures appeared to

be homogenous and uniform with very low porosity through the addition of TiO₂, 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 °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/cm³ at 300 kV/cm was

obtained.

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

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