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# Temperature-stable dielectrics based on Ni-doped $\text{Bi}_2\text{Zn}_{2/3}\text{Nb}_{4/3}\text{O}_7$ pyrochlore ceramics for low temperature co-fired ceramic

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**Abstract:** As an admirable candidate of thermostable LTCC materials,  $\text{Bi}_2(\text{Zn}_{1-x}\text{Ni}_x)_{2/3}\text{Nb}_{4/3}\text{O}_7$  ( $0.0 \leq x \leq 0.5$ ) ceramics with improved dielectric properties have been prepared via conventional mixed oxide route. Microstructure analysis manifests that the phase transition occurs from monoclinic zirconolite phase ( $\beta$ -BZN) to cubic phase ( $\alpha$ -BZN) for Ni doped specimens. The crystal field theory supported the analysis of the initial phase transition processes. From the structure transformation and electrical properties test result, the  $\text{Ni}^{2+}$  substituted  $\text{Zn}^{2+}$  shows an effective method to restrain the grain growth and improve dielectric constant when sintered at 925°C. The temperature coefficient of dielectric constant is controlled by phase composition and is found to be -6.4 ppm/°C at the two-phase coexistence region of the doping content  $x=0.35$ . The dielectric properties of  $\epsilon=101.2$ ,  $\tan\delta=9.5 \times 10^{-4}$  are obtained in this component. The features of the  $\text{Bi}_2(\text{Zn}_{1-x}\text{Ni}_x)_{2/3}\text{Nb}_{4/3}\text{O}_7$  ceramics make them promising for use in high-frequency applications.

## 1. Introduction

With rapid development of economy and wireless communication, the temperature co-fired ceramics technology (LTCC) has obtained increasing attentions due to its low sintering temperature so as to co-fire with Ag electrode in integrating

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