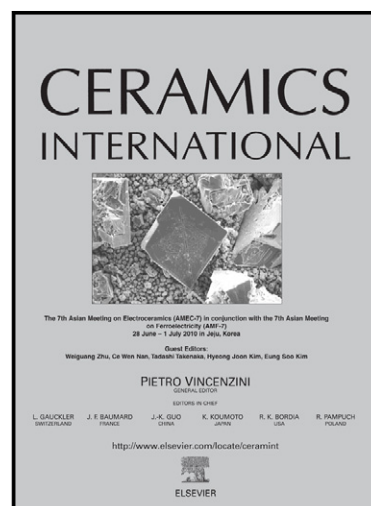


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Effect of LiF addition on phase structure and piezoelectric properties of (Ba,Ca)(Ti,Sn)O₃ ceramics sintered at low temperature

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Abstract

In this study, a series of (Ba_{0.95}Ca_{0.05})(Ti_{0.90}Sn_{0.10})O_{3-x}LiF (BCTS-*x*LiF) ($0 \leq x \leq 6$ mol%) lead-free piezoceramics were fabricated by conventional solid-state reaction method. The incorporation of LiF could significantly improve the sinterability of BCTS ceramics by reducing the sintering temperature from 1480 °C to 1250 °C, where a relative density over 90% was achieved with grown grains of 5-20 μm. X-ray diffraction and Raman spectroscopy experiments revealed that BCTS-*x*LiF ceramics are composed of coexisting *R-O-T* phases at $0 \leq x \leq 1$ and *R-T* phases at $2 \leq x \leq 6$ at room temperature. Optimal piezoelectric properties of $d_{33}=510$ pC/N, $k_p=40.9\%$, $\epsilon_r=5370$, $\tan \delta=0.019$ and $dS/dE=961$ pm/V were obtained at $x=5$, which is attributed to the coexistence of *R* and *T* phases with an optimum ratio at room temperature and dense structure with large grains.

Keywords: BCTS; LiF addition; Low-temperature sintering; Piezoelectric properties

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