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Authors: Bing Liu, Yu Hui Huang, Kai Xin Song, Lei Li, Xiang Ming Chen



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Structural evolution and microwave dielectric properties in $\text{Sr}_2(\text{Ti}_{1-x}\text{Sn}_x)\text{O}_4$ ceramics

Bing Liu^{a,b,§,*}, Yu Hui Huang^{b,§}, Kai Xin Song^a, Lei Li^b, and Xiang Ming Chen^{b,*}

a. *College of Electronic Information and Engineering, Hangzhou Dianzi University, Hangzhou 310018, China.*

b. *Laboratory of Dielectric Materials, School of Materials Science and Engineering, Zhejiang University, Hangzhou 310027, China.*

§ The authors contributed equally to this work and should be listed as co-first authors.

*Corresponding authors. E-mail: liubing@hdu.edu.cn, xmchen59@zju.edu.cn

Abstract

The structure and microwave dielectric properties of $\text{Sr}_2(\text{Ti}_{1-x}\text{Sn}_x)\text{O}_4$ ceramics were determined in the entire composition range of $x = 0-1.0$. X-ray diffraction patterns and Raman spectra indicated a composition-induced onset of octahedral tilting at $x = 0.75$, and the crystal structure transformed from tetragonal ($I4/mmm$) to orthorhombic ($Pccn$). An obvious change of grain morphology was observed in the phase transformation region as well. The variations of the microwave dielectric properties with composition were systematically investigated and the effect of octahedral tilting on the evolution of τ_f value was emphasized. Moreover, the relationship between τ_ϵ and tolerance factor of the present ceramics was revealed and compared with the empirical rule in perovskite structure. The role of tolerance factor in designing the materials with required performance was highlighted.

Keywords: $\text{Sr}_2(\text{Ti}_{1-x}\text{Sn}_x)\text{O}_4$ ceramics, octahedral tilting, microwave dielectric properties

§ The authors contributed equally to this work and should be listed as co-first authors.

*Corresponding authors. E-mail: liubing@hdu.edu.cn, xmchen59@zju.edu.cn

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