

复相陶瓷 BSTN的相组成和微观结构与 Sr/Ba比的关系

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**摘要** 按配方 $(1-x)\text{BaO} \cdot x\text{SrO} \cdot 0.7\text{TiO}_2 \cdot 0.3\text{Nb}_2\text{O}_5$ 制备不同Sr/Ba比的钙钛矿/钨青铜复相陶瓷, 用XRD和SEM研究其组成和结构与Sr/Ba比的关系. 结果表明, 改变Sr/Ba比对两相稳定共存没有影响; 受同一体系中两相不同固溶能力控制, 钙钛矿相中 $\text{Ba}^{2+}$ 和 $\text{Sr}^{2+}$ 之间的置换几率远大于钨青铜相中, 其Sr/Ba比随体系Sr/Ba比变化, 而钨青铜相的Sr/Ba比维持约0.667基本不变; 控制体系Sr/Ba比偏离该值, 钙钛矿相的晶格常数相应偏离标准值, 而钨青铜相基本不变; 提高Sr/Ba比, 钙钛矿相晶粒尺寸减小, 而钨青铜相变化不明显. 两相共存体系中, 当两相都可形成固溶体但固溶能力不同时, 固溶度大的一相优先参与置换, 并抑制另一相的固溶.

**关键词** [BSTN复相陶瓷](#), [Sr/Ba比](#), [相组成](#), [微观结构](#)

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## Relationship of Composition and Microstructure to Sr/Ba Ratio of BSTN Composite Ceramics

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### Abstract

In our previous work, the BSTN composite ceramics in which two phases of the perovskite (BST) and the tungsten bronze (SBN) coexist were successfully prepared in situ by controlling excess components in  $\text{BaO-SrO-TiO}_2\text{-Nb}_2\text{O}_5$  system. What the formation, microstructure and properties of BST and SBN mainly depend on Sr/Ba ratio is well known. The Sr/Ba ratio may affect the structure and properties of the composite ceramics, too. In this paper, the effects of Sr/Ba ratio on the phase composition and microstructure of the composite ceramics were investigated in detail. X-ray diffractometry (XRD) and scanning electron microscope (SEM) were used to characterize the phase composition and microstructure of the composite ceramics. The results show that the Sr/Ba ratio increases in the perovskite phase and keeps almost constant in the tungsten bronze phase with increasing the content of strontium in the two-phase-coexistence composite BSTN system. The constant Sr/Ba ratio in the tungsten bronze phase is about 0.667. The crystal lattices of the perovskite phase in composite system are larger or smaller respectively than them in pure  $(1-x)\text{BaO} \cdot x\text{SrO} \cdot \text{TiO}_2$  system when the Sr/Ba ratio is respectively  $<0.667$

or  $>0.667$ . The crystal lattices of the perovskite phase in both systems show the same crystal lattices when the Sr/Ba ratio is 0.667. Affected by the ratio of Sr/Ba required in the tungsten bronze phase in the composite system, the contents of the perovskite phase decreases while the tungsten bronze phase increases with increasing ratio of Sr/Ba. For the same reason, the average grain size of the perovskite phase and the density of the composite ceramics decrease as the ratio of Sr/Ba increases. If the substitution of ions can take place both in the two phases in a composite system with two phases, the substitution will take place first in the phase with higher solubility of ions while it will be restrained in the other phase.

**Key words** [BSTN composite ceramics](#), [Sr/Ba ratio](#), [phase composition](#), [microstructure](#)

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