

铅对 $(\text{Pb}_x, \text{Sr}_{1-x})_{0.85}\text{Bi}_{0.1}\text{TiO}_3$ 薄膜结构与介电可调性影响的研究

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摘要 用溶胶-凝胶法制备了 $(\text{Pb}_x, \text{Sr}_{1-x})_{0.85}\text{Bi}_{0.1}\text{TiO}_3$ 薄膜, 对其晶相结构、

微观形貌和介电可调性进行了研究. 结果表明, 该薄膜以钙钛矿形式存在.

快速热处理过程可分解得到高活性离子, 直接形成比相应温度平衡状态析晶时更多的晶相量.

这种晶相在一定条件下有分解和再结晶的趋势. 随着 $\text{Pb}^{2+}$ 离子增加和 $\text{Sr}^{2+}$ 离子减少,

钙钛矿相的四方相与立方相间的转变温度升高. 薄膜处在铁电相和顺电相转变点附近时, 可以获得较大的可调性.

关键词 [PST薄膜](#) [介电性能](#) [溶胶-凝胶法](#) [晶相形成](#)

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## Influence of Pb on the Structure and Dielectric Properties of $(\text{Pb}_x, \text{Sr}_{1-x})_{0.85}\text{Bi}_{0.1}\text{TiO}_3$ Thin Films

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**Abstract**  $(\text{Pb}_x, \text{Sr}_{1-x})_{0.85}\text{Bi}_{0.1}\text{TiO}_3$  thin films with perovskite structure were prepared on ITO glass substrate by a sol-gel method. XRD, SEM and impedance analyzer were respectively used to characterize the phase status, morphology and dielectric properties of the films. The results show that during the formation of  $(\text{Pb}_x, \text{Sr}_{1-x})_{0.85}\text{Bi}_{0.1}\text{TiO}_3$  thin films, nucleus of the perovskite phase are initially formed and then congregated together. These aggregated nucleus are then transformed as the perovskite-phase crystalline. And finally, the crystalline phase grows and separates gradually to form the perfect crystalline structure. The content of the perovskite phase formed in the thin film under rapid thermal process(RTP) is more than that formed in kinetic equilibrium under traditional heat treatment. It is due to the high active decomposed ions forming the perovskite phase directly when heat-treated by RTP. The structure of the perovskite phase has a close relation to the ratio of Pb/Sr in the system because of the difference of radius between  $\text{Pb}^{2+}$  and  $\text{Sr}^{2+}$ . The transformation temperature between cubic and tetragonal of the perovskite phase is increased as increasing  $\text{Pb}^{2+}$  whose radius is larger than that of  $\text{Sr}^{2+}$ . It appears at room temperature when the content of  $\text{Pb}^{2+}/\text{Sr}^{2+}$  is about 0.4/0.6. Meanwhile, the tetragonality of the perovskite phase is increased with increasing  $\text{Pb}^{2+}$  ions. High tunability of the  $(\text{Pb}_x, \text{Sr}_{1-x})_{0.85}\text{Bi}_{0.1}\text{TiO}_3$  thin film is exhibited when the film composition is close to transformation point between paraelectric and ferroelectric.  $\text{Pb}^{2+}$  ions act as a dominant factor to affect the Curie point of the system and then to change tunability.

**Key words** [PST films](#) [dielectric properties](#) [sol-gel method](#) [phase formation](#)

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