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NbO_3-$LiNbO_3$无铅压电陶瓷的烧结特性和压电性能研究

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摘要

采用传统陶瓷烧结工艺制备了(1-x)($K_{0.5}Na_{0.5}$)NbO_3- $x$$LiNbO_3$无铅压电陶瓷, 研究了陶瓷的结构、烧结特性及电性能特征. 制备的 ($K_{0.5}Na_{0.5}$)NbO_3- x$LiNbO_3$陶瓷为单一的钙钛矿结构, 室温下其相结构随LiNbO3含量增加逐渐由正交相向四方相转变, 显微结构也由于$LiNbO_3$含量的不同而表现出很大差异. 与($K_{0.5}Na_{0.5}$)NbO_3陶瓷相比, ($K_{0.5}Na_{0.5}$)NbO_3- $LiNbO_3$陶瓷的烧结温度降低, 烧结特性得到改善. ($K_{0.5}Na_{0.5}$)NbO_3- $LiNbO_3$陶瓷表现出优越的压电性能, 其中0.94($K_{0.5}Na_{0.5}$)NbO_3- 0.06$LiNbO_3$(x=0.06)陶瓷的压电常数d_{33}达到205pC/N, 机电耦合系数k_p为40.3%, k_t达到49.8%.

关键词 无铅压电陶瓷 压电性能 (K0.5Na0.5)NbO3-LiNbO3 钙钛矿结构

分类号 TM282

Sintering Characteristic and Piezoelectric Properties of Lead-free ($K_{0.5}Na_{0.5}$)NbO_3-$LiNbO_3$ Ceramics

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Abstract

Lead-free (1-x)(1-x)($K_{0.5}Na_{0.5}$)NbO_3- $x$$LiNbO_3$ piezoelectric ceramics were prepared by a traditional ceramic processing. The sintering characteristic, the microstructure and electrical properties of (1-x)($K_{0.5}Na_{0.5}$)NbO_3- $LiNbO_3$ ceramics were investigated. Results show that all specimens exhibit a pure perovskite structure and the phase structure at room temperature transforms from orthorhombic to tetragonal with the increase of LiNbO3.The microstructure of (1-x)($K_{0.5}Na_{0.5}$)NbO_3- $LiNbO_3$ ceramics exhibits apparent difference due to different amounts of $LiNbO_3$. The sinterability of (1-x)($K_{0.5}Na_{0.5}$)NbO_3- $LiNbO_3$ is improved and the sintering temperature is lower than that of pure KNN ceramics. The (1-x)($K_{0.5}Na_{0.5}$)NbO_3- $x$$LiNbO_3$($x$=0.06) ceramics exhibits an excellent piezoelectric properties with the piezoelectric constant d_{33}, the electromechanical coupling coefficients k_p and k_t of 205pC/N, 40.3% and 49.8%, respectively.

Key words lead-free piezoelectric ceramics piezoelectric properties (K0.5Na0.5)NbO3-LiNbO3 perovskite structure

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