

论文

Li改性铌钽酸钾钠无铅压电陶瓷的研究

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摘要 利用固相反应法制备了 $(\text{Na}_{0.52}\text{K}_{0.48-x}\text{Li}_x)(\text{Nb}_{0.86}\text{Ta}_{0.10}\text{Sb}_{0.04})\text{O}_3$ 系无铅压电陶瓷, 研究了不同Li含量(x分别为0、0.02、0.04、0.06、0.08)样品的显微结构、物相组成及电性能. 结果表明, Li含量的改变对其物相组成、压电性能、铁电性能、介电性能都有显著影响. 当Li含量x从0增大到0.04时, 其压电性能相应提高, 当Li含量x超过0.04时, 压电性能明显下降; 在x=0.04时综合性能最好, 其压电常数 d_{33} 高达260pC/N, 介电损耗 $\tan\delta$ 为0.027, 平面机电耦合系数 k_p 值达到50%, 剩余极化强度 P_r 为 $22\mu\text{C}\cdot\text{cm}^{-2}$, 矫顽电场 E_c 为 $0.95\text{kV}\cdot\text{mm}^{-1}$, 居里温度为 316°C . 另外, 随着Li含量增加, 该系统的矫顽电场明显增强, 居里温度有所提高.

关键词 [铌钽酸钾钠](#) [无铅压电陶瓷](#) [压电性能](#) [铁电性能](#) [介电性能](#)

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Li-modified Sodium Potassium Tantalum Niobate Lead-free Piezoelectric Ceramics

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Abstract Lead-free piezoelectric $(\text{Na}_{0.52}\text{K}_{0.48-x}\text{Li}_x)(\text{Nb}_{0.86}\text{Ta}_{0.10}\text{Sb}_{0.04})\text{O}_3$ ceramics were prepared by solid state reaction. The microstructure, phase and electric properties were studied for $(\text{Na}_{0.52}\text{K}_{0.48-x}\text{Li}_x)(\text{Nb}_{0.86}\text{Ta}_{0.10}\text{Sb}_{0.04})\text{O}_3$ samples with different Li content (x being 0, 0.02, 0.04, 0.06, 0.08). Results show that their phases, piezoelectric, dielectric and ferroelectric properties of $(\text{Na}_{0.52}\text{K}_{0.48-x}\text{Li}_x)(\text{Nb}_{0.86}\text{Ta}_{0.10}\text{Sb}_{0.04})\text{O}_3$ lead-free ceramics are much influenced by the content of Li ions. The piezoelectric properties are enhanced when Li content increases from 0 to 0.04, and decreased when Li content (x) is more than 0.04. Best electric properties are obtained for the sample when x equals 0.04, with its piezoelectric constant d_{33} being 260pC/N, dielectric loss $\tan\delta$ being 0.027, planar coupling factor k_p being 50%, remanent polarization P_r being $22\mu\text{C}\cdot\text{cm}^{-2}$, coercive electric field E_c being $0.95\text{kV}\cdot\text{mm}^{-1}$, Curie temperature being 316°C . With the increase of Li content, the coercive electric field E_c increases obviously, and the Curie temperature is also enhanced.

Key words [sodium potassium tantalum niobate](#) [lead-free piezoelectric ceramics](#) [piezoelectric properties](#) [ferroelectric properties](#) [dielectric properties](#)

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