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残余氧化硼对钛酸锶钡晶胞参数及相变温度的影响

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摘要 研究了氧化硼掺杂(B_2O_3)烧结钛酸锶钡 ($Ba_{1-x}Sr_xTiO_3$, x=0、0.4、1)陶瓷钙钛矿结构的稳定性、晶胞参数以及相变温度. 结果表明, 随着掺杂量的增加, 钛酸锶钡仍保持原来的钙钛矿结构, 但晶胞参数有所变化. 晶格常数c与a并非单调变化, 但轴比c/a单调递减而晶胞体积a^2c却单调增大. 和未掺杂钛酸锶钡相比, 掺杂钛酸锶钡陶瓷的相变温度有所升高. 同一掺杂含量下, 随着烧结温度的升高, 因钛酸锶与钛酸钡相互固溶引起晶胞体积明显收缩, 相变温度逐渐降低. 但在同一烧结温度下, 随着掺杂量的增加, 相变温度几乎不变. 说明硼离子半径虽然很小, 氧化硼对钛酸锶钡晶胞参数的影响还是存在的, 而且只能以填隙方式存在于晶胞, 但其固溶能力非常有限.

关键词 钛酸锶钡 氧化硼 晶胞参数 相变温度

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Effect of Doping B_2O_3 on Cell Parameters and Transition Temperature of $Ba_{1-x}Sr_xTiO_3$ Ceramics

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Abstract The stability of perovskite structure, cell parameters and phase transition temperature of sintered B_2O_3-doped $Ba_{1-x}Sr_xTiO_3$(x=0～1) ceramics were investigated. The results show that, with dopant amount increasing, the perovskite structure is maintained but the cell parameters are changed slightly. The c and a change irregularly, while c/a and cell volume (a^2c) monotonously decreases and increases respectively. The trasition temperature of doped $Ba_{1-x}Sr_xTiO_3$ will rise a little, compared with that of undoped ones. With sintering temperature rising, transition temperature decreases since cell volume contracts due to solutionizing of Ba and Sr (with the same dopant content). But with dopant amount increasing, the transition temperature changes hardly (with the same sintering temperature). It means that B_2O_3 does affect the cell parameters of $Ba_{1-x}Sr_xTiO_3$, although the ionic radius of B^{3+} is very small; B^{3+} entered and stayed in the cell in interstitial mode, but its solid solubility is very limited.

Key words Ba1-xSrxTiO3 B2O3 cell parameters transition temperature

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