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高度织构$NaCo_2O_4$陶瓷的热电性能研究

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摘要　结合固相反应法和冷高压成型技术制备了具有高度结晶各向异性的热电氧化物陶瓷$NaCo_2O_4$. X射线衍射和扫描电子显微镜测试表明冷高压压制成型后烧结有利于样品内层状晶粒的c轴沿着施压方向取向排列, 形成高度织构. 室温以下热电性质的测试表明, 电阻率ρ和Seebeck系数S呈现出金属性, S>0, 属于p型热电材料. 与其他方法制备的样品进行比较, 虽然晶界或点缺陷对声子散射的减少导致上述样品的热导率偏高, 但是由于\rho降低、S升高, 使得热电品质因子ZT值提高, 300K时ZT值达到0.013.

关键词　NaCo2O4陶瓷　高度织构　热电性能

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Thermoelectric Properties of Highly Textured $NaCo_2O_4$ Ceramics

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Abstract $NaCo_2O_4$ thermoelectric oxide ceramics with high crystallographic anisotropy were synthesized successfully by combining the traditional solid-state reaction and cold high pressure compacting method. XRD and SEM measurements show that the sintering after cold-high-pressure compacting is helpful to align the c-axis of layered grain within the sample along the pressing direction, i.e. the sample is highly textured. The thermoelectric properties of $NaCo_2O_4$, measured below room temperature exhibit a metallic behavior in both the resistivity ρ and Seebeck coefficient S. The sign of S is positive, indicating a p-type thermoelectric material. Compared with the samples prepared with other methods, although the thermal conductivity is higher due to the suppression of the phonon scattering by grain boundary or point defect, the above sample exhibits lower ρ and higher S which leads to the improvement of the ZT value that reaches 0.013 at 300K.

Key words　NaCo2O4 ceramics　high texture　thermoelectric properties

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