19a-F11-8

Preparation of high performed $Bi_2Sr_2Co_2O_x$ thermoelectric ceramics by a partial melting method followed by a hot pressing process

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Several studies highlighted the promising potential of $Bi_2Sr_2Co_2O_x$ composition (BSC-222 phase) as thermoelectric material for high temperature application in air. BSC-222 exhibits a layered structure, where CoO_2 layers alternate with $Bi_2Sr_2O_4$ block layers along the c-axis with a misfit structure [1] so that a decrease of the thermal conductivity through phonon scattering at the interface between layers would be expected. At 973 K in air, a promising *ZT* value of about 0.2 has been measured in BSC-222 polycrystalline materials [2], this being however too low for efficient thermoelectric conversion generators. For improving the efficiency of thermoelectric polycrystalline materials, the enhancement of the material density, the improvement of grain alignment and the increase of the average grain size in order to decrease scattering of electron carriers at grain boundaries in prepared samples are usually investigated for improving electrical transport properties. We recently reported the efficiency of using hot pressing or partial melting processing ways for the preparation of BSC-222 ceramics possessing high density and improved grain alignment or large grain size, respectively [3]. Both processing techniques allow a significant decrease of the electrical resistivity, especially in partial melted samples. Moreover, partial melted ceramics possess a decreased thermal conductivity linked to porosity or phonon scattering sites, leading to a large improvement of *ZT* values in BSC-222 ceramics. By combining both partial melting and hot pressing processing techniques, the preparation of BSC-222 ceramics possessing high thermoelectric performances is expected. In this study, the relationship between the processing parameters, the microstructure and the thermoelectric properties of as prepared BSC-222 ceramics have been investigated.

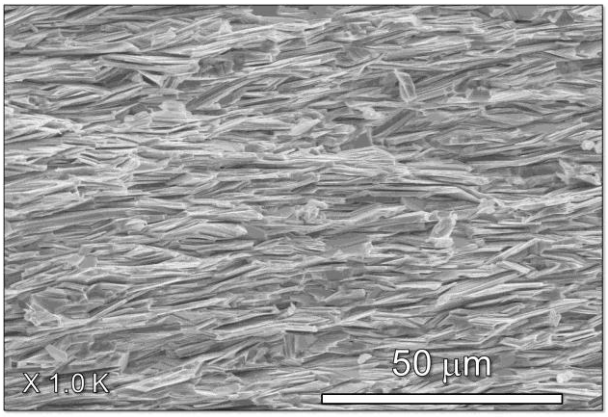

Figure: Scanning Electron Micrograph of BSC-222 polycrystalline ceramic (cross-section) prepared through partial melting step combined with hot pressing, as prepared BSC-222 ceramic possessing simultaneously optimized grain alignment, high bulk density and large grain size.

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