

Mechanical and anisotropic properties of $\text{Ca}_3\text{Co}_4\text{O}_9$ thermoelectric ceramics processed by Hot-Pressing and Spark Plasma Sintering

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$\text{Ca}_3\text{Co}_4\text{O}_9$ (349) thermoelectric ceramics were successfully prepared by Conventional Sintering (CS), Hot-Pressing (HP) and Spark Plasma Sintering (SPS), using a 349 powder synthesized by a conventional solid-state reaction method. Microstructural investigations have shown that HP processing is effective to obtain highly textured 349 ceramics, with a degree of crystallite orientation showing a texture index of 6 mrd^2 , and that SPS processing affords strong densified 349 ceramics, typically 98% of the theoretical X-ray density. Mechanical properties were studied by using Vickers indentation and nanoindentation techniques. The hardness, H , and Young's modulus, E , of the HP and SPS samples were greatly improved, compared with the CS samples. These properties are correlated to the microstructure and texture of the samples. Also, the HP and SPS processings allow enhancing the thermoelectric properties, which were investigated between 0 and 800 K.

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