

# MECHANICAL AND THERMOELECTRIC PROPERTIES OF $\text{Ca}_3\text{Co}_4\text{O}_9$ CERAMICS CONSOLIDATED BY SPS

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**Abstract:** Oxide  $\text{Ca}_3\text{Co}_4\text{O}_9$  (349) thermoelectric (TE) ceramics were successfully prepared by Spark Plasma Sintering (SPS) process. The various parameters influencing the processing of 349-densified and textured 349 TE ceramics have been investigated. The effects of the uni-axial pressure (30 - 75 MPa) and the dwell temperature (700 - 900°C) were examined. Different cooling rate of the applied thermo-mechanical cycle were also tested. Microstructure investigations have revealed strong enhancements of the bulk density and the texture strength, and a decrease of the in-plane grain boundary density as the applied pressure is increased. The mechanical properties were performed using nanoindentation and Vickers techniques and carrying out three point bending tests. Hardness, H, elastic modulus, E, and fracture toughness,  $K_{IC}$ , were shown to improve and depend on the SPS process. These properties were correlated to the microstructure and the texture features. In addition, the TE properties at high temperature were performed and discussed.

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