Synthesis and Spark Plasma Sintering of CeB_6

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Abstract

Cerium hexa-boride (CeB_6) with simple cubic type structure has attracted growing interests in terms of attractive electronic and magnetic properties. Due to its excellent field emission and/or thermionic emission properties there are great research prospects for bulk polycrystalline CeB_6 as a cathode material for various applications and devices. In above-mentioned fields compared to the nanowires and films that are used commercially, the polycrystalline bulk materials can provide large size with a relative low cost and can be fabricated easily.

The present study describes the synthesis and densification of polycrystalline cerium hexaboride (CeB_6) using the Spark Plasma Sintering (SPS) technique. Cerium oxide (CeO_2) and amorphous boron (B) powders were used as starting powders. Both synthesis and consolidation of CeB_6 material was successfully achieved by applying a two-step heating schedule at varying temperatures (1000°C-1650°C). Formation of B_4C particles was observed in terms of the sintering temperature and the reaction between different reactants. Samples showed ohmic behavior with very low electrical resistivity values upto 35 $\mu\Omega$.cm.

Keywords: CeB_6, Spark Plasma Sintering, Cathode material,