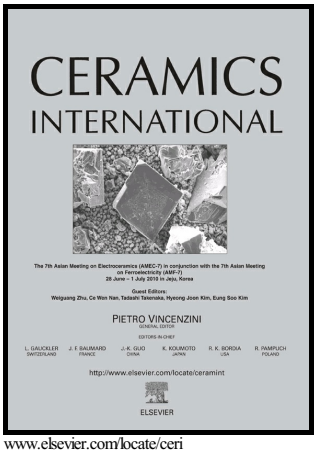

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Abstract

Titanium diboride powders have been synthesized by means of carbothermal reduction method utilizing Titanium oxide, Boric acid and Graphite. The effect of mechanical activation of mixed raw materials and the use of additional Boric acid on the final phases have been studied. The resultant powders were characterized by X-ray diffraction (XRD) analyzer and Field Emission Scanning Electron Microscope (FESEM). XRD patterns showed that TiB_2, TiC and C phases after heat treatment at stoichiometric ratio of reactants. By increasing the milling time, the unwanted phases such as C and TiC will be reduced. Pure TiB_2 could be synthesized with mechanical activation of raw materials for 24 h at non-stoichiometric ratio (using additional Boric acid).and heat treatment at low temperature of 1380 ºC. In this condition, Titanium diboride could be achieved with residual carbon of 0.92± 0.09 wt% and mean average particle size of 3.28 µm. Thermal analysis (TGA-DTA) was used to determine the reaction progress and mechanism. Results revealed that the intermediate phase, $TiBO_3$, played an important role in getting to lower temperature synthesis. This phase was identified after mechanical milling of raw materials and heat treatment at temperature of 1250 ºC.

Keywords: Titanium diboride; Carbothermal reduction; Mechanical milling; Thermal analysis (TGA-DTA); $TiBO_3$