

Determination of Sintering Parameters of TiB_2 - Ti_3SiC_2 Composites

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Abstract : The densification behavior of TiB_2 - Ti_3SiC_2 composites is investigated for temperatures in the range of 1200°C to 1400°C, for the pressure of 40 and 50MPa, and for holding time between 15-30 min by spark plasma sintering (SPS) technique. Ti, Si, TiC and 5 wt.% TiB_2 were used to synthesize TiB_2 - Ti_3SiC_2 composites and the effect of different sintering parameters on the densification and phase evolution of these composites were investigated. The bulk densities were determined by using the Archimedes method. The polished and fractured surfaces of the samples were examined using a scanning electron microscope equipped with an energy dispersive spectroscopy (EDS). The phase analyses were accomplished by using the X-Ray diffractometer. Sintering temperature and holding time are found to play a dominant role in the phase development of composites. Ti_5C_4 and TiSi_2 secondary phases were found in 5 wt.% TiB_2 - Ti_3SiC_2 composites densified at 1200°C and 1400°C under the pressure of 40 MPa, due to decomposition of Ti_3SiC_2 . The results indicated that 5 wt.% TiB_2 - Ti_3SiC_2 composites were densified into the dense parts with a relative density of 98.77% by sintering at 1300 °C, for 15 min, under a pressure of 50 MPa via SPS without the formation of any other ancillary phase. This work was funded and supported by Scientific Research Projects Commission of Eskisehir Osmangazi University with the Project Number 201915C103 (2019-2517).

Keywords : densification, phase evolution, sintering, TiB_2 - Ti_3SiC_2 composites

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