

Effect of SPS Parameters on the Densification of ZrB₂-Based Composites

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Abstract : Spark Plasma Sintering is a new technique which was used for ultra high temperature ceramics such as ZrB₂-based composites in recent years. Taguchi design was applied to explore effective parameters for achieving the highest hardness. Nine factors including SiC, Cf, MoSi₂, HfB₂ and ZrC content, milling time of Cf and SPS parameters such as temperature, time and pressure in four levels were considered through the Taguchi technique. In this study, only the effect of SPS conditions on densification and hardness were investigated. ZrB₂-based composites were prepared by SPS in different temperatures (1600°C, 1700°C, 1800°C, 1900°C), times (4min, 8 min, 12 min, 16min) and pressures (10MPa, 20MPa, 30MPa and 40MPa). The effect of SPS parameters on the densification and hardness were investigated. It was found, by increasing the temperature and time, from level 1 to 4, densification improved continuously. Also, the results shows hardness increases continuously by increasing temperature and time. Finally, it is concluded that temperature and time have more significant effect on densification and hardness rather than pressure.

Keywords : spark plasma sintering (SPS), ultra high temperature ceramics (UHTCs), densification, hardness

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