

عنوان مقاله:

Effect of Silicon Carbide and graphite additives on the pressureless Sintering mechanism and microstructural characteristics of Ultra-High Temperature ZrB₂ Ceramics Composites

محل انتشار:

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خلاصه مقاله:

The effect of SiC content, additives, and process parameters on densification and microstructural properties of pressureless sintered ZrB₂- (1-10 wt %) SiC particulate composites have been studied. The ZrB₂-SiC composite powders mixed by Spex mixer with 1-2wt% C (added as graphite powder) and CMC have been cold-compacted and sintered in argon environment in the temperature range of 1800-2100°C for 2hs. The amount of densification is found to increase with sintering duration and by prior holding at 1200-1650°C for reduction of oxide impurities (ZrO₂, B₂O₃ and SiO₂) on powder particle surfaces via the formation of new phases such as ZrSi₂ and ZrC in the system. Presence of SiC with average size smaller than that of ZrB₂ appears to aid in densification by enhancing green density, increasing C content by erosion of milling media, and inhibiting matrix grain growth. Both of SiC and C appear to aid in reduction of oxide impurities. The shrinkage of samples was measured, and the microstructure of samples was examined using X-Ray Diffraction and scanning electron microscopy (SEM), equipped with EDS spectroscopy. Room temperature mechanical properties were examined. Sintering temperature has a great effect on relative density, porosity, water absorption, hardness, fracture toughness, oxidation resistance, Strength and microstructure of these composites. The highest relative density, (99.65%), was obtained in ZrB₂-10wt. %SiC-2 wt. %C composites sintered at 2000°C for 2hs

کلمات کلیدی:

Ultra-high temperature ceramics (UHTCs), ZrB₂-SiC composites, Pressureless sintering, Densification, microstructural characteristics

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