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Toughened ZrB₂-based ceramics with addition of SiC whisker or short fiber

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Abstract

In order to improve the fracture toughness, SiC whiskers or SiC chopped fibers were added to a ZrB₂ matrix in volumetric fraction of 10 and 20 vol.%. The composites were hot-pressed between 1650 and 1730 °C and their final relative densities were higher than 95%. Even at the lowest sintering temperature, the whiskers showed an evident degradation. On the other hand, the fibers maintained their initial shape and a strong interface formed between matrix and reinforcement. The fracture toughness of the composites increased from 30 to 50% compared to the baseline material, with the fibers showing a slightly higher toughening effect. In the whiskers-reinforced composites, the room-temperature strength increased when 10 vol.% whiskers were added. In the fibers-reinforced composites, the room-temperature strength decreased regardless the amount of fibers added. The high-temperature strength of the composites was higher than that of the baseline material for both types of reinforcement.