

Effect of W-V Alloying on the FAST/SPS Densification of Wf/W Composites

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Tungsten fiber-reinforced tungsten (Wf/W) composites are promising for fusion applications, but their performance is limited by insufficient matrix densification and fiber embrittlement during conventional high-temperature sintering. Alloying tungsten with vanadium(V) effectively enhances sinterability and modifies densification behavior.

In this study, W-V powders (0-4 wt.% V) were synthesized by mechanical alloying and consolidated via field-assisted sintering technology (FAST/SPS). The effects of V content, sintering temperature, and holding time on densification behaviour were systematically investigated. Relative density was measured using the Archimedes method, while microstructural evolution and elemental distribution were characterized by SEM/EDX.

FAST/SPS enabled rapid densification with limited thermal exposure. V addition significantly enhanced sintering kinetics, achieving relative densities up to ~98% at reduced temperature and shorter holding times. The improved densification is attributed to enhanced diffusion and alloying-activated sintering mechanisms. However, excessive temperature or holding time promoted V diffusion into fibers and microstructural degradation. The results indicate that the synergistic effect of W-V alloying and optimized FAST/SPS processing enables precise densification control and significantly broadens the sintering window of Wf/W composites.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

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