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Enhanced oxidation resistance of Mo-12Si-8.5B alloys with ZrB_2 addition at 1300 °C

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Abstract

Mo-12Si-8.5B and Mo-12Si-8.5B-1.0wt%ZrB_2 alloys were fabricated using mechanical alloying, followed by hot-pressing. Both alloys exhibited uniform microstructure, with the Mo_3Si and Mo_5SiB_2 phases distributing dispersedly in the α-Mo matrix. Mo-12Si-8.5B-1.0wt%ZrB_2 showed a finer-grained microstructure than Mo-12Si-8.5B alloy owing to the addition of ZrB_2. The results of isothermal oxidation tests at 1300 °C in air revealed that Mo-12Si-8.5B and Mo-12Si-8.5B-1.0wt%ZrB_2 alloys initially suffered a transient stage with high mass loss due to the volatilization of MoO_3, and then achieved a steady stage owing to the formation of a protective borosilicate scale on the alloy surface. Especially, the transient stage of Mo-12Si-8.5B-1.0wt%ZrB_2 alloy was shortened to be less than 300 s, and the mass loss of this stage was reduced by at least 88% compared with that of Mo-12Si-8.5B alloy, indicating a significant improvement in the oxidation resistance. The addition of ZrB_2 not only resulted in a continuous borosilicate scale quickly covering the entire base alloy during the transient stage, but also improved the protectiveness of the