Pressureless sintering of Mo-based metal-matrix composites

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Metal-matrix composites (MMCs) are advanced materials and widely used in various fields of industry, where high physical, mechanical and functional properties are of vital importance [1]. Mo-based alloys show great potential for ultrahigh-temperature applications because of their high melting points, high stiffness, and low coefficient of thermal expansion. However, the insufficient strength at elevated temperatures, low-temperature brittleness and poor oxidation resistance are the main concerns for Mo-rich alloys in practical use [2]. Toward this end, fabricating Mo-based MMCs reinforced with multi-phase Mo-Si-B material and Ti_5Si_3 ceramic particles have been aimed to solve the above-mentioned problems. Moreover, using of powder metallurgy technology makes it possible to obtained a uniform distribution of reinforcing particles in the molybdenum matrix as well as a fine-grained MMCs microstructure, which is a necessary condition for high mechanical characteristics.

The activated pressureless sintering (PLS) of MMCs (Mo- matrix reinforced with multi-phase Mo-9Si-8B particles as well as Ti_5Si_3 ceramic particles) by the addition of Ni was applied. The influence of technological parameters of PLS (temperature and holding time) and the concentration of the reinforcing particles were investigated. Based on the analysis of the microstructure and phase composition the main mechanisms of sintering and formation of the composite microstructure were established. The mechanical properties of dense composite materials were also studied.

References

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