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Enhanced liquid-phase sintering of W–Cu composites by liquid infiltration

Abstract

Full-density of consolidated W–Cu composites produced via conventional sintering method is difficult to achieve. In this work, fully-dense W–Cu composites were developed via the combination of the liquid phase sintering (LPS) and the liquid infiltration (LI) methods, which hereinafter is named as Cu-MI technique. It operates at the low sintering temperature of 1150 °C, and maximum densification was possible without requiring a sintering activator such as Ni, Co or Fe. A comparison was also made between the sintering response of W–(13–27 wt.%) Cu composites consolidated using LPS and Cu-MI techniques. The samples were characterized using SEM, EDX and XRD. It was observed that the samples prepared via the Cu-MI method demonstrated a high relative density (> 99% theoretical density). Contrary to the composite sample prepared by the LPS method, the Cu-MI technique accounted for a homogeneous microstructure almost without any pores. The significance of this finding has major industrial implications and has potential to reduce the production costs of composite materials with improved mechanical and electrical properties.

Keywords: W–Cu composites, Liquid-phase sintering, Liquid infiltration, Microstructure