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Fatigue behavior of Al2024 alloy-matrix nanocomposites reinforced with multi-walled carbon nanotubes

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Abstract

Fatigue behavior of aluminum alloy 2024 (Al2024) matrix composites reinforced with multi-walled carbon nanotubes (MWCNTs) is investigated under the tension–compression fatigue test condition. Tensile and fatigue strength of the Al2024/MWCNT composites increases with increasing the MWCNT content. Al2024/4vol.% MWCNT composite shows the notably enhanced fatigue strength of 600 MPa at the 2.5×10^6 cycles and the ratio of tensile strength to fatigue strength of 0.78. When the composite is cyclically loaded, the developed incompatibility between the matrix and the fiber induces the fiber pull-out (not shown under tension) and it acts as a bridge when the cracks propagate. Thus, as the content of MWCNT increases in the composite, the prevailing bridging behavior of MWCNTs enhances the number of fatigue cycle, thereby increasing the fatigue strength.

Keywords: A. Metal-matrix composites (MMCs); B. Fatigue; B. Fracture; E. Powder processing

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