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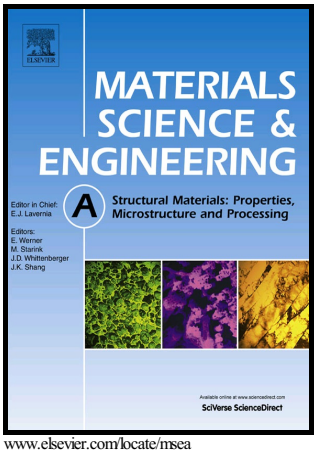


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# Effect of thermomechanical treatment on properties of an extruded Al-3.0Cu-1.2Mg/$SiC_p$ composite

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**Abstract**

Thermomechanical processing determines the practical applications of metal–matrix composites (MMCs) by contributing to the interrelationship between their microstructure and properties. In this study, we investigate the changes in Al-3.0Cu-1.2Mg/$SiC_p$ (40 vol.%) caused by the tension applied at high temperatures and strain rates. The study shows the microstructural changes and mechanical characteristics resulting from the cold/warm and hot rolling of the extruded material. It is observed that hot rolling has a favorable effect on the restoration of the defects formed in parts of the extruded bar. The microstructural characteristics of the composite related to the deformation-induced redistribution of the secondary inclusions in the matrix and fracture of the reinforcement particles are shown. High-temperature uniaxial tensile testing of the studied composite conducted under high strain rates ($10^{-1}$ and $10^{-2}$ $s^{-1}$) indicates an increase in the ductility. The decrease in the stress of the tested samples is attributed to the refined grains in the matrix after the thermomechanical processing. The testing of the given material provides the stress–strain relationships, which indirectly assist in ranking the relative formabilities of the differently processed sheets of the MMCs with a high-volume fraction of the reinforcement particles. The proposed approach may be considered for the near net-shaped manufacturing of MMCs with high wear resistance and low thermal expansion coefficients.

**Keywords**

Metal–matrix composite, extrusion, rolling, tensile testing, plasticity, hardness

## 1. Introduction

Studies of numerous metal–matrix composites (MMCs) have been aimed at combining their high strength and/or ductility characteristics attributed to the numerous metals and alloys with the