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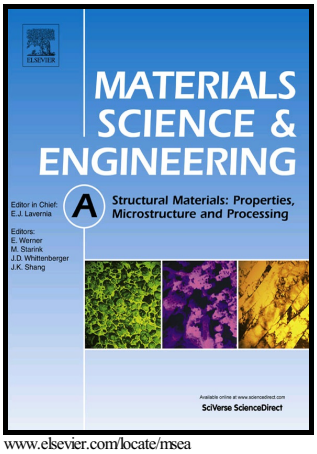

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Dynamic compressive deformation behavior of SiC-particulate-reinforced A356 Al alloy matrix composites fabricated by liquid pressing process

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Abstract

In this study, A356 Al alloy composites reinforced with SiC particulates (SiC_p), whose SiC_p volume fraction was quite high (about 56 vol%) for a candidate surface material of multi-layered armors, were fabricated by a liquid pressing process, and their dynamic compressive properties were investigated by using a split Hopkinson pressure bar. Defects such as misinfiltration or pores were eliminated, but about 2 vol% of eutectic Si particles and about 3 vol% of Fe-Al intermetallic compound particles were contained in the Al matrix. According to the dynamic compressive test results, dynamic compressive strength and strain were much higher than quasi-static ones because of strain-rate hardening effect and existence of molten Al matrix formed by adiabatic heating. The as-cast composite showed the best combination of dynamic strength and strain, together with the highest dynamic toughness, because the crack propagation was effectively blocked by the molten Al matrix and deformation band formation, while the T6-heat-treated composite showed the lowest compressive strain in spite of the highest strength. These findings suggested that the present Al-SiC_p composites could be reliably applied to armors because the dynamic toughness or resistance to fracture was much higher under the dynamic loading than under the quasi-static loading.

Keywords: A356 Al alloy; SiC particulate; liquid pressing process; split Hopkinson pressure bar; strain rate hardening; adiabatic heating

1. Introduction

Armor plates generally require excellent properties such as high hardness, strength, and fracture toughness as well as excellent mobility of armored vehicles by achieving lightweight