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Evaluation of microstructure, damping capacity and mechanical properties of Al-35Zn and Al-35Zn-0.5Sc alloys

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Abstract

Al-35Zn and Al-35Zn-0.5Sc alloys were fabricated in this study. The addition of 0.5 Sc promoted the grain refinement of the Al-35Zn alloys during solidification, heat treatment, and hot rolling. Dynamic precipitation also occurred in the Al-35Zn and Al-35Zn-0.5Sc alloys during rolling. The damping capacity and mechanical properties of the Al-35Zn alloy were improved by the Sc addition and hot rolling. The rolled Al-35Zn-0.5Sc alloy with 90% reduction demonstrated better damping capacity than those of commercial Al alloys and some metallic materials with high damping capacity, which is mainly attributed to the high interface sliding capacity. Compared with the commercial Al alloys, the rolled Al-35Zn-0.5Sc alloy with 90% reduction showed balanced mechanical properties, including high strength and reasonable ductility. This work provided an effective strategy for preparing Al alloys with excellent damping capacity and mechanical properties.

Keywords: Al alloy; Damping capacity; Mechanical properties; Microstructure

1. Introduction

Damping capacity is the ability of a material to dissipate elastic strain energy during mechanical vibration or wave propagation [1]. Development of structural

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