

Design guideline for intermetallic compound mitigation in Al-Mg dissimilar welding through addition of interlayer

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Abstract

This paper critically assesses the recent trends in aluminium-magnesium dissimilar welding and suggests a key design guideline to successfully improve the weld joint quality through addition of interlayer. First, the paper describes the main issue of incompatibility between these metals and considers the root cause of the problem, i.e. the Al-Mg based intermetallic compounds (IMCs). It then reviews the recent trends of interlayer addition in various welding processes to mitigate Al-Mg IMCs. Focusing on laser welding, the paper finally proposes a 3-step design guideline in Al-Mg dissimilar welding through addition of an interlayer and presents a case study of using pure Ni foil as a proof of concept. The design guideline has shown to be an effective means to predict and prevent the formation of deleterious intermetallics.

Keywords

Aluminium; Magnesium; Dissimilar welding; Intermetallic compound; Design guideline

1. INTRODUCTION

1.1 Dissimilar welding

Currently, a major portion of welding research has focused on dissimilar materials welding. The advantages of dissimilar materials welding are vast, such as weight reduction, cost reduction, energy efficiency, optimization of material use, and the ability to ‘tailor’ the materials design according to specific needs, commonly referred to as tailor-welded blanks in the automotive industry [1–4]. Welding processes for dissimilar metals will open up new industrial applications such as in the automotive, aerospace, energy, and medical sectors [5].