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Microstructure and mechanical properties of the heat-affected zone in laser-welded/brazed steel 22MnB5 – AA6016 aluminum / AZ31 magnesium alloy

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Abstract

The martensitic microstructure of the steel 22MnB5 was tempered during laser welding/brazing. The strength of the HAZ greatly decreased from 1500 MPa to 800-1100 MPa, depending on the heat input. The lowest strength always occurred in the area with the highest heat input directly beside the welding zone. The strength of the aluminum alloy was slightly reduced from 233 MPa to 212 MPa. The strongest decrease in the strength did occur in the area with a critical temperature range of 400-500°C due to the coarsening of GP zones. The short heat input in the laser welding/brazing process did not lead to a significant change in the material strength and microstructure in the HAZ of the AZ31 magnesium alloy.

Keywords: heat-affected zone; aluminum; magnesium; high-strength steel; laser welding; brazing

1. Introduction

Many studies in recent years have focused on the development of suitable welding technologies for joining of steel-aluminum and steel-magnesium compounds for application in the