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Characteristics of Welded Thin Sheet AZ31 Magnesium Alloy

Abstract

Conventional arc welding processes are difficult to use to join thin sheet magnesium alloy because of the necessity of high energy input, which in turn leads to various problems such as burn through and distortion. Alternatively, laser welding can resolve these problems because of lower heat input and smaller spot size compared to conventional welding. Even when using laser welding, it is difficult to weld thin magnesium sheets with a thickness of less than 1 mm; cut, melt through and cracks tend to occur due to the evaporation of molten metal and high solidification rate. In this study, an attempt has been made to lap fillet welding of thin sheet magnesium alloy AZ31B with a thickness of 0.3 mm using a pulsed Nd:YAG laser beam in a conduction mode. This paper investigates the occurrence of defects in the lap fillet joint of AZ31B magnesium alloys. Defects such as void and cracks were observed at the weld root. A void at the root occurred because of lack of fusion due to insufficient melting of the lower sheet. The void was reduced by grinding the metal surface to eliminate the oxide layer. Cracks generated in large grain areas initiated from the void at the root. A higher scan speed significantly improves the defect behaviour because of generating a narrow large grain area and wider fine grain area. Macropore-free weld was obtained in this laser welding research, and smaller amount of micropores than the base metal can be attained.

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Keywords Laser Welding · Thin sheet · Magnesium alloy · Welding defects

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