

Laser Welding and Joining Technology for Lightweight Carbody

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Abstract

Vehicle lightweight is one of the major concerns of many of the world's leading automobile companies. Research on the weight reduction of automobiles has attracted attention as a way to maximize engine efficiency in society where environmental awareness and energy saving are becoming more important. Various materials have been developed to satisfy the appearance and performance that satisfy the customer. In order to apply various materials in the right place for lightweight car body, it is required to develop a bonding and fastening method of new materials and different materials. In this study, we introduce the direct welding and joining results of light metal and materials using high power laser beam and introduce the laser assist process which is used for mechanical fastening by the dissimilar material joining method of many materials having different physical properties.

High-power laser processing has the advantage of being able to advantageously not only weld joint processes but also mechanical fastening as a supporter. It is beneficial to perform a free hole operation in mechanical fastening, and it is possible to induce a fastening process which facilitates various additional processes such as increasing the strength of the rivet or lowering the strength of the material. A number of years ago, the Institute of Machinery and Research has developed a laser-assisted machining (LAM) method for cutting high-strength ceramic materials. This is because the CBN tool irradiates the surface of the ceramics specimen to be machined before the turning to induce melting and thermal damage to a part of the ceramics to advantage the machining by the tool to increase the tool life and reduce the cutting force. The laser is a non-contact type machining tool that can cut materials, process holes, surface treatments, heat treatments, and is suitable for hybrid processing. It has a good performance as the processing technology that induces the change of the material characteristics of the composite material cutting, the hole processing, the metal processing and the high power laser, and suggests the possibility of laser assisted processing based on the experimental results.

Keywords: *Laser welding, Laser joining, Laser-assisted processing, Composite material, Mechanical fastening, Lightweight carbody*

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