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Ultrasonic Metal Welding Characteristics of Aluminum Alloy and Automotive Steel Sheet

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Efforts to reduce greenhouse gas emissions worldwide have led to the gradual strengthening of regulations on exhaust gas emissions and hazardous substances. In response to these regulations, the automotive industry is focusing on vehicle lightweight technologies. Combining various materials for vehicle lightweight necessitates dissimilar joining. Ultrasonic metal welding, offering higher energy efficiency compared to conventional welding techniques, forms solid-state joints through ultrasonic vibration energy, promising superior quality in joining dissimilar materials.

This study analyzes the weldability of zinc-coated and uncoated steel sheets, commonly used in automotive applications, using ultrasonic metal welding under various conditions (welding time, pressure, material type) through the mechanical and metallurgical properties. Furthermore, we compare ultrasonic metal welding with resistance spot welding, a crucial aspect of automotive assembly, to validate its feasibility in joining dissimilar materials in vehicle bodies.