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Capacitor discharge welding of nuts to steel sheets

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Abstract: This study is to investigate capacitor discharge welding (CDW) of M8 hexagonal flange welding nuts to Al-Si coated 22MnB5 steel sheets. Pullout tests, microstructural analysis, and fracture examination were conducted. The welding voltage has the biggest effect on mechanical performance and nugget size. The peak load and nugget size gradually increase and then decrease with increasing welding voltage. A modified criterion was established to calculate the minimum diameter to guarantee pullout fracture for nut projection welding. Microstructural evolution was analysed in detail. Three failure modes of the welded joints were examined: interfacial fracture (IF), partial interfacial fracture (PIF) and pullout fracture (PF).

Keywords: capacitor discharge welding; dissimilar; nut; mechanical properties; microstructure; failure modes.

Introduction

In the vehicle industry, nut projection welding is a key manufacturing process which has been widely used for the manufacture of many important vehicle parts such as A-pillars, B-pillars, automobile engines, chassis and gearboxes (Tolf et al., 2007 and Furlanetto et al.,

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