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Properties of lap welds in low carbon galvanized steel produced by tool assisted friction welding

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Abstract

Linear lap welds in very thin plates of galvanized steel were produced using tool assisted friction welding, a friction stir welding related technique. The morphological and microstructural analysis of the welds produced with varying tool rotational speed (up to 1400 rpm), tool traverse speed (up to 1200 mm/min) and tool diameter (10 to 16 mm) revealed the absence of stirred material or important welding defects in most of the joints. For the welds produced with the higher tool traverse and rotational speeds, a strong asymmetry in the weld morphology was also observed. A change in the contact conditions between the tool and the workpiece, from sticking to sliding, is appointed as the main factor responsible for the asymmetry in the weld morphology. The asymmetry in welds morphology has important influence in the failure mode of the welds in lap shear test but no influence on the joint strength. Lap shear strengths similar to base material ultimate tensile strength were measured for most of the welds.

Keywords: Tool assisted friction welding; Friction stir welding; Galvanized steel; Lap joining.

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