

Modeling and optimization of friction stir welding Parameters in joining 5086 H32 Aluminum Alloy

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Abstract:

The present manuscript focuses on developing a mathematical model to predict the intergranular corrosion rate of friction stir welded AA5086 H32 aluminium alloy joints. A central composite design matrix, having 52 experiments, was used in the design of experiments. The developed model was used to examine the impact of studied process parameters, i.e., rotational speed, welding speed, tool shoulder diameter, tool hardness, tilt angle, and pin profile, on intergranular corrosion rate of the welded joints. Response surface methodology was used to optimize the process parameters in minimizing the susceptibility to intergranular corrosion attack. The optimum combination of studied parameters to have minimum corrosion rate, i.e., 3.2 mg/cm², was 1296 rpm rotational speed, 79.4 mm/min welding speed, 14.9 mm tool shoulder diameter, 47.4 HRC tool hardness, 2.38 tilt angle, and Square pin.