Simulation and modeling of friction welding of stainless steel to aluminum alloy using finite element method and artificial neural network

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Abstract
Aluminum to stainless steel joints are broadly used in industries in order to reduce fuel consumption. While fusion welding is not a suitable method to join these metals, solid state welding, like friction welding (FW), is an effective way to this process. However, risk of intermetallic compounds (IMCs) formation is probable in these welds. In previous investigations formation of FeAl$_3$, Fe$_2$Al$_5$ and Fe$_4$Al$_{13}$ is reported. In this study, effect of different parameters on generated heat and temperature distribution that lead to formation of these compounds in a FW of aluminum alloy to stainless steel is investigated using Finite Element Method (FEM). Additionally, a mathematical modeling of the parameters is performed using Artificial Neural Network (ANN) and the optimum level of the parameters has been found.

Keywords: Friction Welding, dissimilar joint, Finite Element Method, Artificial Neural Network.