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A robust process-structure model for predicting the joint interface structure in impact welding

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Abstract

In this work, a numerical simulation framework based on the finite element method (FEM) with Eulerian formalism is developed to model the high-speed impact between metal plates. The model accounts for the thermomechanical interactions in the process and captures the complex interfacial deformations. A thorough validation of the model is achieved by comparing the wave characteristics obtained from numerical simulations with the experimental results from vaporizing foil actuator welding. The amplitude and wavelength of the interfacial waves and the resulting joint microstructure are shown to depend significantly on the process conditions and the specific material system, which is well captured by the model.

KEY WORDS: Eulerian formulation; Finite element method; Dissimilar materials joining.

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