عنوان مقاله:

A Coupled Rigid-viscoplastic Numerical Modeling for Evaluating Effects of Shoulder Geometry on Friction Stir-welded Aluminum Alloys

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خلاصه مقاله:

Shoulder geometry of tool plays an important role in friction-stir welding because it controls thermal interactions and heat generation. This work is proposed and developed a coupled rigid-viscoplastic numerical modeling based on computational fluid dynamics and finite element calculations aiming to understand these interactions. Model solves mass conservation, momentum, and energy equations in three dimensions, using appropriate boundary conditions, considering mass flow as a non-Newtonian, incompressible, viscoplastic material. Boundary conditions of heat transfer and material flow were determined using a sticking/sliding contact condition at tool / workpiece interface. Thermal history, as well as shear stress and rotational speed fields, forces and torque values for three shoulder geometry conditions were calculated. Numerical results of thermal history, torque and forces during welding showed good correlation with experimentally measured data.

کلمات کلیدی:

Friction Stir Welding, Finite element model, Aluminum Alloy, Heat generation, plasticity