

SIMULATION AND EXPERIMENTAL INVESTIGATION OF EXPLOSIVELY CLADDED DISSIMILAR MATERIALS: ALUMINIUM AND COPPER

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ABSTRACT

Explosive welding is a non-conventional joining technique. In this process stable detonation of high energy explosive is used to clad similar or dissimilar materials. In this paper weldability criteria for joint between Aluminium-copper plates is studied both theoretically and by finite element based simulation technique. Plates are cladded using parallel plate configuration and then different mechanical tests micro- hardness, tensile shear test for bond strength examination were performed. To study the bonded & debonded region of the explosively welded plate phased array ultrasonic testing machine was applied. A 2D numerical model has been developed using ANSYS /AUTODYN software package and Euler solver was effectively used to reproduce jetting effect and welding interface. In this analysis it has been observed that most part of jet has been produced by Al (flyer) plate and the shear stress directions are different at collision point and are greater than the yield strength of the materials. In modelling temperature was observed below the melting temperature of the materials which confirms the process as solid state joining. The simulation has been done for three different loading ratios with same stand off distances. The results obtained from this simulation results were consistent with the experiment work and also satisfy the criteria required for a good quality bond in the explosive welding process.

Keywords: Aluminium; Copper; Explosive welding; ANSYS/AUTODYN; Phased array ultrasonic testing machine; Explosive loading ratio.

