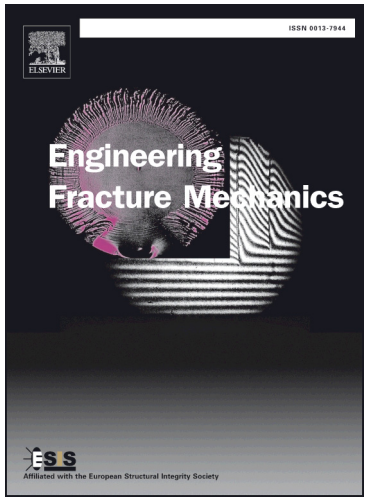

Stress Intensity Factor Solutions for Welds in Lap-Shear Specimens of Dissimilar Sheet Materials with and without Kinked Cracks

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Stress Intensity Factor Solutions for Welds in Lap-Shear Specimens of Dissimilar Sheet Materials with and without Kinked Cracks

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Abstract

Global stress intensity factor solutions for welds with various widths in lap-shear specimens of magnesium alloy AZ31 and high-strength low-alloy steel sheets are developed using finite element analyses. Results are compared to and validated with the analytical solutions based on the beam bending theory and semi-infinite planes with connection. Analyses are also conducted using modified elastic constants with a bimaterial constant of zero for specimens with small kinked cracks. Results indicate that the stress intensity factor solutions for a vanishing kink length can be approximated by the available analytical solutions for the zero bimaterial constant for fatigue cracks growth models. The results of the global stress intensity factor solutions and the local stress intensity factor solutions for kinked cracks with the experimentally observed kink angle as functions of the kink length can be adopted for fatigue life estimations of ultrasonic welds in lap-shear specimens of magnesium and steel sheets.

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