Transient thermomechanical analysis of 2D-assembly structures with brazed joints using a hybrid "MAX-FEM" model

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ABSTRACT

This work deals with the performance of a new approach combining the numerical eXtended Finite Elements Method 'X-FEM' and the analytical method of Matched Asymptotic Expansions 'MAE'. The proposed new "MAX-FEM" model is well adapted for studying and modeling the thermomechanical behavior of mediums containing thin layers such as adhesive joints without any required mesh refinement in their vicinity. The methodology consists of the construction of enrichment parameters with the 'MAE' technique and their integration into the 'XFEM' formulation. Correction matrices of stiffness and conductivity are then defined and integrated in the FEM computation algorithm. To describe the mechanical behavior of a proposed structure with 2D brazed joints, the "MAX-FEM" hybrid model has been implemented as an UEL subroutine under Abaqus implicit. Compared with the classical FE method, the obtained results in terms of temperature, stress field, strains and displacements show a good accuracy without any required mesh refinement.

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