MODELING OF WELDS IN NICKEL-BASE SUPERALLOYS

Background
This project is a part of a large project about welding of nickel base alloys. These alloys are used in the high temperature parts of aero engines and are thus heavily alloyed. However, the weldability of these alloys is limited, mainly due to the risk of different kinds of hot cracks. One particular kind of cracking appears for example during heat treatment of welded components or in multi-layer welds during repair welding. These cracks are called "strain-age cracking". Especially alloys hardened by precipitation of γ'-particles, like Waspalloy are sensitive to strain-age cracking. However, the mechanism behind strain-age cracking is not well understood. Thus, in this project a model of a repair weld in a nickel-base alloy shall be developed, to help to better understand the mechanism behind these cracks.

Goal
To build up a model for a multi-layer weld correctly predicting the size and shape of each weld bead and illustrating different isotherms in the weld. The figure below shows to the left a macrograph of a real weld in a nickel-base alloy and to the right is a simulation of a similar weld in steel. The task is to create a similar model for nickel-base alloys, with isothermes relevant for these alloys. This would give a better possibility to identify in what regions strain age cracks are located.

Work procedure
The project will consist of creating the model for a multi-layer weld. The work will mainly be carried out in University West welding laboratories in Trollhättan. The project is made in cooperation Volvo Aero.

Group size 1
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