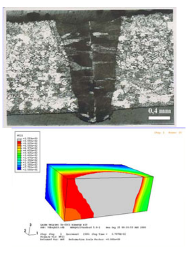
Laser beam welding (LBW) has become common practice in the production lines of several industrial sectors. The main objective of the present work is the simulation of the microstructural evolution in the HAZ of the 6xxx Al alloys, in order to predict the softening as a function of welding conditions. Towards this scope, a large series of bead-on-plate laser welding experiments has been conducted in order to determine the effect of heat input on weld geometrical characteristics and hardness. Temperature distributions and weld thermal cycles in the HAZ were determined by employing either the finite element method, or the inverse analysis method.

The HAZ softening observed, reflect the relevant microstructural changes due to dissolution and coarsening of the strengthening precipitates during the weld thermal cycle. This change in hardness have been successfully modeled by employing the methodology of computational thermodynamics and kinetics. In this way the volume fraction and average precipitate size were calculated for several types of weld thermal cycles, under extremely non-isothermal conditions. Calculated hardness profiles in the HAZ are in good agreement with the experimental values.



In the attachment below a presentation given at the 7th Int. Conf. On Trends in Welding Research, which was held at Pine Mountain, Georgia, USA, is provided.

More info can be found in:

A.D. Zervaki & G.N. Haidemenopoulos, Computational Kinetics Simulation of the Dissolution and Coarsening in the HAZ during Laser Welding of 6061-T6 Al-alloy, Welding Journal, Vol.86, pp. 211s-221s, 2007.