Microstructure simulation of AA3105 aluminium alloy during homogenization treatment

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In this study, the microstructural evolution of an as-cast AA3105 aluminium alloy during homogenization treatment was simulated with the ClaNG model. The simulated data were compared with experimental data. The ClaNG model is a statistical solid-state precipitation model which is based on the classical nucleation and growth theory. The growth function is based on the mean-field approach. The ClaNG model is coupled with a thermodynamic database considering the elements Al, Mg, Si, Fe, Cu and Mn with their corresponding stable and metastable phases. During the homogenization process, the evolution of β″, β′, and β (Mg_2Si) phases were studied. In order to calibrate the model and validate the simulations, differential scanning calorimetry (DSC) experiments were carried out. DSC tests were conducted to record heating curves between 25 and 600 °C, with heating rates of 0.01 and 0.1 K/s. Microscopy investigations were used to verify the precipitate phases and their size distributions. The results show that the DSC data and simulations are matched and the final microstructure of the homogenized sample is predicted rather well.