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A COUPLED CELLULAR AUTOMATON-FINITE DIFFERENCE MODEL FOR THE SIMULATION OF THE AUSTEMPERING OF A DUCTILE IRON

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Abstract. The Austempered Ductile Iron (ADI) is a metallic alloy commonly employed in different types of industries such as automotive, agricultural, and mining due to its good mechanical properties and cost saving in comparison with steel and aluminum alloys. The ADI microstructure is formed by graphite nodules embedded in a metallic matrix that is constituted by ferrite and retained austenite. The microstructure is obtained by means of the ausferritic transformation, in which austenite transforms into ferrite platelets by a displacive growth mechanism. In this work the phase evolution is analyzed by a coupled cellular automaton-finite difference model, in which the phase evolution and the carbon diffusion are solved at the microstructure level. The role of phase nucleation, austenite carbon enrichment, and contact between phases, in the different stages of the growth kinetics, are studied. Moreover, the simulations of the phase transformation are compared with experimental data reported in the literature. The numerical results are in good agreement with the experimental measurements.