The Use of Computer Simulation of the Microstructure of Al-Alloys in Industrial Practice

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Abstract

Computer-based alloy and process development requires the integration of models for simulating the evolution of microstructure, microchemistry and crystallographic texture into process models of the thermo-mechanical production of Al sheet. In the present paper, a softening model simulating the progress of recovery and recrystallisation and the following texture changes is linked to deformation and microchemistry models. The possibility of such coupled simulations is illustrated by way of the thermo-mechanical processing of Al-Mn-Mg AA 3104 can stock. In particular, the impact of inter-stand recrystallisation between the tandem hot rolling passes as well as recrystallisation during coil cooling ("self-annealing") on the resulting hot strip and final gauge textures are explored. Finally, the predicted textures are input into a polycrystal-plasticity model to simulate anisotropic properties (earing behaviour) of the sheets. Thus, it is possible to link the materials properties at final gauge to the decisive steps of deformation and recrystallisation along the thermo-mechanical process chain.