

Austenite formation kinetics from multicomponent cementite-ferrite aggregates by in situ neutron powder diffraction

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The development of third generation advanced high strength steels (AHSS) as the next generation sheet steel grade is driven by the automotive industry. The key processing step is called 'intercritical annealing' at temperatures in the region of the ferrite and austenite two-phase field. The transformed austenite during intercritical annealing will be retained at a metastable state in the final microstructure. Controlling the fraction and chemistry of austenite and resulting mechanical properties is critical for many AHSS.

The kinetics of austenite formation depend sensitively on the initial microstructure and annealing conditions. In this talk, we will present detailed kinetic studies of austenite formation from cementite-ferrite aggregate in a range of AHSS grades via in situ neutron powder diffraction at WOMBAT. The quantitative phase analyses highlight that the saturation of transformation kinetics in relation to global equilibrium is affected by the competition between different interface migration. Depending on the relative contribution of cementite dissolution in respect to migrating interface of austenite/ferrite, the incomplete dissolution of enveloped cementite limited by slow diffusion in austenite could result in austenite plateauing below equilibrium, while fast dissolution of matrix cementite could result in austenite plateau above equilibrium. Both contributions need to be considered and modelled to describe the austenite formation kinetics. The experimental and computational work in this contribution would guide future processing and alloy design of AHSS.

Speakers Gender

Male

Level of Expertise

Early Career <5 Years

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No

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