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## **Ex- and in-situ measurements with dilatometer”.**

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The phase transition kinetics in austempered ductile iron (ADI) and perferritic ductile iron (IDI) are investigated by means of neutron diffraction and dilatometry at the STRESS-SPEC instrument. Measurements with the new TA Instruments 805 A/D quenching dilatometer characterize in-situ the transition from austenite to ferrite. The short instrumental setup description is followed by a comparison of achieved results by dilatometry and neutron diffraction. Both methods give insight into the carbon enrichment at austenitization temperature of 900 °C as well as on the subsequent quenching process to isothermal annealing temperature between 300 °C and 400 °C. The quenching of the material leads to ausferritic microstructure formation during annealing which contains retained austenite, acicular ferrite and graphite nodules. The addition of alloying elements like Cu or Mo leads to a retardation of the decomposition of the retained austenite and opens a process window for heat treatment before carbide formation sets in. The influence of the alloying element Mo on the decomposition of retained austenite is presented. The macroscopic length change evaluated by dilatometry is influenced by phase transition and carbon enrichment of the retained austenite. Neutron diffraction enables distinguishing between the lattice expansion caused by both effects.

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