

Investigation of Martensite Formation in Fe Based Alloys During Heating From Boiling Nitrogen Temperature - DTU Orbit (08/11/2017)

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The austenite-to-martensite transformation at temperatures below room temperature was investigated in situ by magnetometry in Fe-N, Fe-Cr-C and Fe-Cr-Ni based alloys. After quenching to room temperature, samples were immersed in boiling nitrogen and martensite formation was followed during subsequent heating to room temperature. Different tests were performed with heating rates ranging from 0.5 K/min to 10 K/min. For comparison a sample was up-quenched in water to verify whether martensite formation can be suppressed at high heating rates. Thermally activated formation of martensite during heating was convincingly demonstrated for all investigated materials by showing heating rate dependent transformation kinetics. Moreover, magnetometry showed that the heating rate influences the fraction of martensite formed during the thermal treatment. The activation energy for thermally activated martensite formation as quantified by a Kissinger-like method lies in the range 11–18 kJ/mol and increases with the total fraction of interstitials in the alloy.

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