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Multi-scale phase quantification of strain-induced martensite in Austempered Ductile Iron (ADI) using different neutron diffraction techniques

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Austempered ductile iron (ADI) is an attractive material with excellent mechanical properties, like high strength, good ductility, wear resistance and fatigue strength. Its mechanical properties are largely determined by the ausferritic microstructure which contains retained high carbon enriched austenite. The retained austenite will become unstable under plastic deformation and will transform to strain-induced martensite. Because of plastic deformation and similar crystal structure of martensite and ferrite, the quantitative phase analysis of the strain-induced martensite in ADI using diffraction techniques has two difficulties, i.e., texture formation and peaks overlapping. These difficulties will influence the accuracy of quantitative phase analysis. By means of different neutron diffraction techniques and methods, like standard Rietveld method using whole diffraction pattern (SPODI + STRESS-SPEC) including the texture effect, texture method from the measured pole figure intensity (STRESS-SPEC) and Bragg edge neutron transmission method (Antares), the difficulties in phase quantification were will be presented in current contribution. Furthermore, the advantages, disadvantages and accuracy of each method will be discussed and summarized.

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