The formation of reverted austenite in 18% Ni 300 grade maraging steel after creep exposure

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Maraging 18Ni steels are very low carbon iron–nickel alloys, with sufficiently high nickel content to produce martensite following air cooling to room temperature upon solution treatment. The term maraging is derived from martensite age hardening, and it denotes the age hardening of a low carbon, iron–nickel lath martensite matrix. By the other hand, martensite is not the stable equilibrium phase in the sense that prolonged high temperature exposure would lead to the reversion to the equilibrium austenite phase [1]. In the present work, the austenite reversion of maraging 300 steel after creep exposure in the temperature range of 550 ºC to 650 ºC and stress range of 300 MPa to 500 MPa was studied by X-ray diffraction, optical microscopy and transmission electron microscopy. Optical microscopy is very useful to show distribution of the reverted austenite. The bright patchy regions shown in the optical micrographs correspond to regions having considerable reverted austenite fraction. Volume fraction of austenite was estimated by X-Ray diffraction rom the α'_{110} and γ_{111} peaks of martensite and austenite, respectively, as per the direct comparison method, resulting in a range of 17.2% to 48.5% of reverted austenite, dependent of time, temperature and applied stress. A great amount of reverted austenite formed inside the lath and along the lath martensite boundaries could be observed by transmission electron microscopy. The volume fraction of austenite reversion increased with increasing temperature and/or time of exposure, leading to undesirable alloy's strength reduction.

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References

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