Experimental and Numerical study of 316H stainless steel under thermo-mechanical cyclic loading conditions

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ABSTRACT

True stress and strain are necessary to estimate the rupture life under thermo-mechanical fatigue with dwell conditions. Finite element analysis (FEA) is one of the most reliable methods to calculate true stress and strain, but the accuracy of the obtained result depends great deal on the constitutive model utilized. 304 and 316 austenitic stainless steel is known as the material which exhibits remarkable cyclic hardening around 500℃. Therefore, cyclic thermo-mechanical material models were developed to achieve highly accurate prediction of cyclic behavior[1][2]. In this paper, non-unified constitutive model has been proposed, where inelastic strain is decomposed into creep strain and visco-plastic strain. In addition, a cyclic hardening effect and thermal recovery effect were introduced into the non-unified constitutive model to predict true stress and true strain under thermo-mechanical fatigue with dwell conditions. The material constants were identified by isothermal creep-fatigue tests. As a consequence, it was revealed that the calculated stress and strain showed high correspondence with the experimental results by utilizing the non-unified constitutive model.

REFERENCES

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