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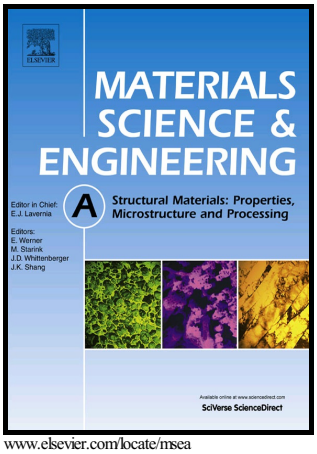

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Stability of retained austenite in martensitic high carbon steels. Part II: Mechanical stability

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Abstract

The mechanical stability of retained austenite is explored in martensitic bearing steels under cyclic compressive stresses up to $\sim 10^6$ cycles at 3 GPa, combining X-ray diffraction and repetitive push testing. Finite element analysis and hardness testing were adopted to interpret the stress distribution across the specimen, and the stress-strain response was revealed. Austenite decomposition was observed for all samples regardless of the difference in their chemical composition and volume percentage. The decomposition is partial and a significant amount of austenite could be retained even after $\sim 10^6$ stress cycles. A scenario revealing different stages of retained austenite behaviour under compressive stresses has been established. It is observed that retained austenite first decomposes during the first tens of cycles and at 10^3 cycles, whilst it remains stable at cycles ranging 10^2–10^3 and after 10^4. More importantly, results show the potential TRIP effect of retained austenite decomposition on dynamic hardening of bearing steels.

Keywords: Martensitic steel, Austenite stability, Work hardening, Fatigue test, Mechanical properties

1. Introduction

Retained austenite present in steels could decompose during plastic deformation, resulting in transformation-induced plasticity (TRIP) effect which not only enhances steel strength

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