CSTAM2013 - P01 - A0025

Reliability analysis of very-high-cycle fatigue crack initiation for a high strength steel

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Abstract

A high carbon chromium steel was tempered at 150℃, 180℃, and 300℃ to form three groups of specimens, and very-high-cycle fatigue (VHCF) tests were performed via rotating bending to investigate scatter properties of S-N curves. Experimental results show an increasing tendency of life scatter with the increasing of tempering temperature. Influencing factors and mechanism of fine-granular-area (FGA) were discussed. Crack growth rate and life proportion of FGA were also estimated. At last reliability analysis based on a modified Tanaka-Mura model was carried out to evaluate the sensitivity of inclusion size, stress, and ΔK_{FGA} for the life of VHCF crack initiation.