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VIII ВСЕРОССИЙСКАЯ НАУЧНО-ПРАКТИЧЕСКАЯ КОНФЕРЕНЦИЯ С МЕЖДУНАРОДНЫМ УЧАСТИЕМ, ПОСВЯЩЕННАЯ 50-ЛЕТИЮ ОСНОВАНИЯ ИНСТИТУТА ХИМИИ НЕФТИ

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EFFECT OF THE STRAIN RATE ON THE LOW CYCLE FATIGUE BEHAVIOR OF A 10Cr-2W-Mo-3Co-NbV STEEL AT ROOM TEMPERATURE

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The effect of a strain rate varying from ~10^{-3} to ~10^{-5} s^{-1} at a strain amplitude ranging from ±0.25% to ±0.6% on the low cycle fatigue (LCF) behavior and the microstructure of a 10%Cr-2%W-0.7%Mo-3%Co-NbV steel with 0.008 wt.% B and 0.003 wt.% N additions was studied at room temperature. The number of cycles to failure tends to slightly increase with decreasing the strain rate. The fatigue life time curves at all tested strain rates and strain amplitudes could be described using the Basquin-Manson-Coffin relationship. The transition life of 2Nt, when plastic and elastic strain components are equal, shifted to higher reversals with a decrease in the strain rate from ~10^{-3} to ~10^{-4} and ~10^{-5} s^{-1}, whereas the transition total strain amplitude, when plastic and elastic strain components are equal, remained unchanged. At cyclic deformation with low strain amplitude of ±0.25%, strain softening is attributed to decreasing dislocation density and lath coarsening, whereas at ε_{ac} =±0.6%, the knitting reaction between dislocations comprising lath boundaries and trapped lattice dislocation leads to the transformation of lath boundaries to subboundaries and strain softening. At ε_{ac}=±0.25%, decreasing the strain rate leads to insignificant acceleration of recovery processes, whereas at ε_{ac}=±0.6%, decreasing the strain rate slows down the knitting reaction, that leads to an increase in density of low-angle boundaries and kernal average misorientation.