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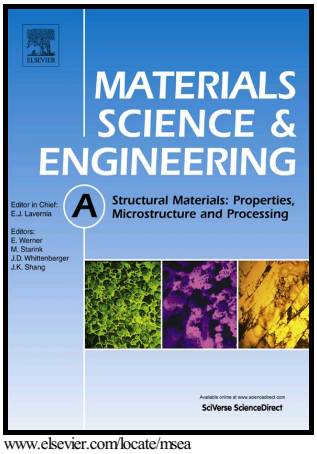

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Mechanisms and New Parameter Attribute Reduction of High-speed Railway Wheel Rim Steel Subjected to Low Temperature Fatigue

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Abstract

A series of characterization tests were performed to elucidate the high-cycle fatigue behavior in a type of steel often used in high-speed railway wheel rims. The specimens were cyclically-loaded with a constant stress amplitude of 370MPa at the stress ratios of -1 at a test temperature range from -60^{0}C to 60^{0}C. It was found that the steel showed differences in the evolution of microstructures (slip system, dislocation structure, austenite transformation, sub-grains), which led to significant changes in the mechanism of dissipation of strain and fatigue behavior. However, all microstructure orientations on fracture surfaces within grains or sub-grains were approximately uniform and were inclined to primary slip planes {110} and {112} in BCC crystal structure. In addition, the rough set theory model was introduced for the attribute reduction of characteristic parameters. Four sets of attribute reductions based on decisions were obtained, and each one had only three characteristic parameters. Developing a new parameter attribute reduction model was of great importance in building a comprehensive understanding of the characteristic parameters as well as the development of new methods for reliable fatigue lifetime calculations.