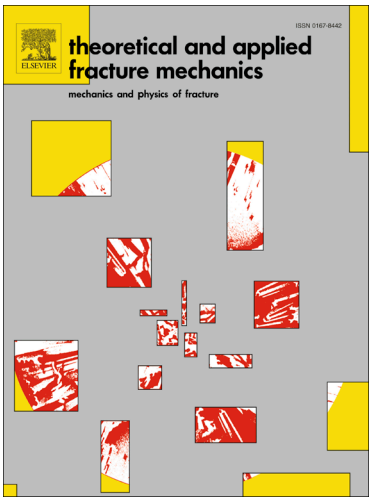

The Influence of a Static Constant Normal Stress Level on the Fatigue Resistance of High Strength Spring Steel

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Abstract

This paper presents a method to determine the optimal static compress normal stress level for alternate torsional loaded tabular bar in order to ensure longer lifetime. Numbers of cycles to failure of the springs, which have been subjected to static compress normal stress on different levels were obtained experimentally. The paper analysed the stress state for biaxial loaded tabular torsion springs for different theoretical criterions as Columg-Mohr, Drucker - Prager criterion, the Sines criterion, criterion Crossland and Dang Van fatigue criterion. The analysis results are compared with the experimentally obtained average values. Comparison between the experimentally obtained and calculated theoretical points of the stress state, indicating that the longest life expectancy reached the point closest to the area of the double-axle stress state endurance in all measures except the Drucker-Prager criterion. Also theoretical results, from mentioned criteria, show that with increasing constant compression stress at a constant alternating torsional stress, the points are shifted from the area of safe to the area of fatigue failure.

Keywords: multi-axial fatigue criterion, torsion, axial pre-stress, high-cycle fatigue