

Influence of temperature on the R-effect for the fatigue crack growth of nickel-base superalloy GH4169

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Abstract

The stress ratio (R) effect, especially at elevated temperatures, is associated with the fatigue crack growth (FCG) prediction in aero-engine hot-end components under complex operation conditions. The FCG experiments with three R were conducted on Ni-based superalloy GH4169 at room temperature (RT), 550 °C, and 700 °C. The results indicate that the R-effect on the FCG of GH4196 is temperature-dependent. Therefore, efforts were made to identify the R-effect at various temperatures to describe the FCG. The concept of the crack-closure or the two-driving-force was examined to quantify the R-effect considering the temperature influence. Fractographic analyses on the fracture surface were performed to discuss the underlying mechanism responsible for the temperature influence. The study can contribute to the R-dependent FCG modeling at various temperatures.

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