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Temperature and frequency influence on the cyclic deformation behavior of EN-GJS-600 (ASTM 80-55-06) ductile cast iron at 0.005 and 5 Hz

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Abstract

In the present paper, the physically based fatigue lifetime calculation approach “PhyBaL_{SIT}” was modified for isothermal low cycle fatigue of ductile cast iron EN-GJS-600 in the temperature range from ambient temperature up to 400 °C at a frequency of 0.005 Hz. One strain controlled temperature increase test is sufficient to determine the temperature for onset and most pronounced influence of dynamic strain aging, i.e. the reduction of dislocation mobility due to diffusing interstitial atoms. The comparison to prior results at 5 Hz and to results at 47 and 92 Hz reveals the significant influence of deformation rate on the temperature range of dynamic strain aging. With the results at 0.005, 47 and 92 Hz presented in this paper and at 5 Hz previously published, sound knowledge how elevated temperatures and deformation rate affect dynamic strain aging, cyclic deformation behavior and fatigue lifetime in the LCF- and HCF- regime is generated.

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