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## 铸造镍基高温合金疲劳裂纹的形成与扩展

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### FATIGUE CRACK INITIATION AND PROPAGATION OF NICKEL BASE SUPERALLOY

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摘要

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**摘要** 本文对铸造镍基高温合金光滑板试样(经过热等静压处理)疲劳裂纹的形成与扩展进行了研究。扫描电镜观察到裂纹在碳化物、显微疏松及其附近的基体上形成。着重观察了裂纹从20~2000 $\mu\text{m}$ 长度范围内的扩展行为,以及从微观裂纹到宏观裂纹转变的特征。从裂纹长度和循环次数的关系可以看到小裂纹( $<1000\mu\text{m}$ )的扩展是不连续和不规则的,它表明显微组织(特别是晶界)对裂纹扩展速率有影响。但是,用裂纹的平均扩展速率仍可描述小裂纹的长大过程,小裂纹的扩展速率至少比长裂纹的扩展速率高一个数量级。

**关键词:**

**Abstract:** Investigation of fatigue crack initiation and propagation has been carried out on smooth plate specimens of a nickel base cast superalloy treated by HIP. SEM observations showed that the crack initiated at carbides, microporosities and in the matrix near the microporosities. In the observations emphasis was put on the growth of cracks from 20 $\mu\text{m}$  to 2000 $\mu\text{m}$  long and the characteristics of micro/macro crack transition. A discontinuous and irregular crack growth rate of the short cracks ( $<1000\mu\text{m}$ ) found in L-N plot indicates a marked influence of microstructure, especially at grain boundaries. Although the transient growth rate of microcrack is quite complicated and sensitive to microstructure, the perturbation may be concealed by an average growth rate. The propagation rate of small crack is at least an order of magnitude faster than that of LFM large crack.

**Keywords:**

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