<<材料的高温变形与断裂>>

图书基本信息

书名：<<材料的高温变形与断裂>>

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前言

Many structural components used in the industrial facilities for energy re-sources， petrochemical, aeronautical and aerospace engineering are operatingat high temperatures. For instance， the vapor temperature in a thermal powerstation is about 600度，the temperatures for hydrogen production and ethyl-ene-cracking are as high as 950度and 1050度， respectively and the workingtemperatures of turbine blades in an aircraft exceed 1000 ~C. High tempera-ture strength is therefore the major concern of these materials. High temperature strength is defined as the resistance of a material tohigh temperature deformation and fracture. The definition of high temperatureis the temperatures at which the atomic diffusion is fast enough to affect sig-nificantly the plastic deformation and fracture behaviors of materials. Usual-ly， for metallic alloys the temperatures considered are higher than one half oftheir melting points （Tm）.

内容概要

本书内容分两篇共25章。
上篇为高温变形篇，包括金属与合金蠕变的宏观规律、蠕变位错亚结构、纯金属蠕变、固溶体合金蠕变、第二相粒子强化合金蠕变、扩散蠕变、超塑性以及多轴蠕变等内容，重点论述蠕变过程中位错与各种晶体缺陷的交互作用、蠕变微观机制以及蠕变物理模型和理论。
下篇为高温断裂篇，包括蠕变空洞形核和长大、蠕变裂纹扩展、蠕变损伤与断裂的评价与预测、高温低周疲劳断裂、蠕变疲劳交互作用以及材料的高温环境损伤等内容，从微观、宏观和唯象三个层次论述了高温断裂理论及其工程应用。
　本书可作为高等院校材料学科研究生教学参考书，也可供材料、固体物理和力学专业教师及科研人员参考。

书籍目录

章节摘录

The correlation between K and the crack growth rate is poor for materials with goodductility. In addition, the stress intensity factor K cannot correlate the crack growthdata obtained for different types d specimens of identical materials. Figure 19. 10（a）shows the crack growth rate plotted against stress intensity factor obtained from sin-gle edge notched （SEN） and notched center hole （NCH） specimens of a 316 stainlesssteel. The two types of specimen exhibit different a~K correlations. For in-stance， a single relationship is found for the SEN specimens， but the same relation-ship is not found for the NCH specimens. Instead， it shows great variations ingrowth rate for very slight changes in K. These observations indicate that the stressfactor K is not the exclusive crack-tip parameter controlling the growth rate of creepcrack. In fact， the stress intensity factor K is the fracture mechanics parameterwhich describes the elastic stress field and the elastoplastic stress field under smallscale yielding conditions. In materials with low creep resistance and high creep ductil-ity， the elastic stress field of the crack tip can be easily relaxed by the fast creep de-formation， resulting in large scale of creep or even whole-section creep. In this case， the stress intensity factor cannot be utilized as the parameter to describe the stressfield of the crack tip and the growth rate of creep crack in the ductile materials suchas stainless steels， low-alloy steels and pure metals ， etc. ……

编辑推荐

The energy, petrochemical, aerospace and other industries all require materialsable to withstand high temperatures. High temperature strength is definedas the resistance of a material to high temperature deformation and fracture.This important book provides a valuable reference to the main theories of hightemperature deformation and fracture and the ways they can be used to predictfailure and service life. Part I reviews the mechanisms of high temperature deformation in metals, alloys, metal matrix composites and intermetallic compounds. It discusses creepbehaviour such as dislocation and recovery as well as superplastic deformation, diffusional and multiaxial creep. Part II discusses high temperature fracture, starting with the nucleation and growth of creep cavities before analysing creepcrack growth and damage. Later chapters review ways of predicting creep rupture, creep-fatigue interactions and modelling service life. High Temperature Deformation and Fracture of Materials will be an importantreference for both academic researchers and those industry using these hightemperature materials. Professor Jun-Shan Zhang works within the School of Materials Science andEngineering at Dalian University of Technology, China.