

<<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>>

13位ISBN编号：9787030275400

10位ISBN编号：7030275403

出版时间：2010-7

出版时间：科学出版社

作者：张俊善

页数：365

版权说明：本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问：<http://www.tushu007.com>

## <<材料的高温变形与断裂>>

### 前言

Many structural components used in the industrial facilities for energy re-sources , petrochemical , aeronautical and aerospace engineering are operating at 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度和 1050度 , respectively and the working temperatures of turbine blades in an aircraft exceed 1000 ~C. High temperature strength is therefore the major concern of these materials. High temperature strength is defined as the resistance of a material to high temperature deformation and fracture. The definition of high temperature is the temperatures at which the atomic diffusion is fast enough to affect significantly the plastic deformation and fracture behaviors of materials. Usually , for metallic alloys the temperatures considered are higher than one half of their melting points (  $T_m$  ) .

## <<材料的高温变形与断裂>>

### 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。

<<材料的高温变形与断裂>>

书籍目录

Author contact details Preface Part I High Temperature Deformation 1 Creep Behavior of Materials 1.1 Creep Curve 1.2 Stress and Temperature Dependence of Creep Rate 1.3 Stacking Fault Energy Effect 1.4 Grain Size Effect References 2 Evolution of Dislocation Substructures During Creep 2.1 Parameters of Dislocation Substructures and Their Measurements 2.2 Evolution of Dislocation Substructure during Creep 2.3 Dislocation Substructure of Steady State Creep 2.4 Inhomogeneous Dislocation Substructure and Long-Range Internal Stress References 3 Dislocation Motion at Elevated Temperatures 3.1 Thermally Activated Glide of Dislocation 3.2 Measurement of Internal Stress 3.3 Climb of Dislocations 3.4 Basic Equations of Recovery Creep 3.5 Mechanisms of Recovery References 4 Recovery-Creep Theories of Pure Metals 4.1 Introduction 4.2 Weertman Model 4.3 Models Considering Sub-Boundary 4.4 Models Based on Dislocation Network 4.5 Creep Model Based on the Motion of Jogged Screw Dislocation 4.6 Summary of Recovery Creep Models 4.7 Soft and Hard Region Composite Model 4.8 Harper-Dorn Creep References 5 Creep of Solid Solution Alloys 5.1 Interaction Between Dislocation and Solute Atom 5.2 Creep Behavior of Solid Solution Alloys 5.3 Viscous Glide Velocity of Dislocations 5.4 Creep Controlled by Viscous Glide of Dislocations References 6 Creep of Second Phase Particles Strengthened Materials 6.1 Introduction 6.2 Arzt-Ashby Model 6.3 Creep Model Based on Attractive Particle-Dislocation Interaction 6.4 Interaction of Dislocation with Localized Particles 6.5 Mechanisms of Particle Strengthening 6.6 Grain Boundary Precipitation Strengthening References 7 Creep of Particulates Reinforced Composite Material 7.1 Creep Behavior of Particulates Reinforced Aluminium Matrix Composites 7.2 Determination of Threshold Stress 7.3 Creep Mechanisms and Role of Reinforcement Phase References 8 High Temperature Deformation of Intermetallic Compounds 8.1 Crystal Structures, Dislocations and Planar Defects 8.2 Dislocation Core Structure 8.3 Slip Systems and Flow Stresses of Intermetallic Compounds 8.4 Creep of Intermetallic Compounds 8.5 Creep of Compound-Based ODS Alloys References 9 Diffusional Creep 9.1 Theory on Diffusional Creep 9.2 Accommodation of Diffusional Creep Grain Boundary Sliding 9.3 Diffusional Creep Controlled by Boundary Reaction 9.4 Experimental Evidences of Diffusional Creep 10 Superplasticity 10.1 Stability of Deformation 10.2 General Characteristics of Superplasticity 10.3 Microstructure Characteristics of Superplasticity 10.4 Grain Boundary Behaviors in Superplastic Deformation 10.5 Mechanism of Superplastic Deformation 10.6 The maximum Strain Rate for Superplasticity References 11 Mechanisms of Grain Boundary Sliding 11.1 Introduction 11.2 Intrinsic Grain Boundary Sliding 11.3 Extrinsic Grain Boundary Sliding References 12 Multiaxial Creep Models 12.1 Uniaxial Creep Models 12.2 Mutiaxial Creep Models 12.3 Mutiaxial Steady State Creep Model 12.4 Stress Relaxation by Creep References Part II High Temperature Fracture 13 Nucleation of Creep Cavity 13.1 Introduction 13.2 Nucleation Sites of Cavity 13.3 Theory of Cavity Nucleation 13.4 Cavity Nucleation Rate References 14 Creep Embrittlement by Segregation of Impurities 14.1 Nickel and Nickel-Base Superalloys 14.2 Low-Alloy Steels References 15 Diffusional Growth of Creep Cavities 15.1 Chemical Potential of Vacancies 15.2 Hull-Rimmer Model for Cavity Growth 15.3 Speight-Harris Model for Cavity Growth 15.4 The role of Surface Diffusion 16 Cavity Growth by Coupled Diffusion and Creep 16.1 Monkman-Grant Relation 16.2 Beer-Speight Model 16.3 Edward-Ashby Model 16.4 Chen-Argon model 16.5 Cocks-Ashby Model References 17 Constrained Growth of Creep Cavities 17.1 Introduction 17.2 Rice Model 17.3 Raj-Ghosh Model 17.4 Cocks-Ashby Model References 18 Nucleation and Growth of Wedge-Type Microcracks 18.1 Introduction 18.2 Nucleation of Wedge-Type Cracks 18.3 The Propagation of Wedge-Type Cracks 18.4 Crack Growth by Cavitation References 19 Creep Crack Growth 19.1 Crack-Tip Stress Fields in Elastoplastic Body 19.2 Stress Field at Steady-State-Creep Crack Tip 19.3 The Crack Tip Stress Fields in Transition Period 19.4 Vitek Model for Creep Crack Tip Fields 19.5 The Influence of Creep Threshold Stress 19.6 The

<<材料的高温变形与断裂>>

Experimental Results for Creep Crack Growth	References	20	Creep Damage Mechanics	20.1
Introduction to the Damage Mechanics	20.2	Damage Variable and Effective Stress	20.3	Kachanov Creep
Damage Theory	20.4	Rabotnov Creep Damage Theory	20.5	Three-Dimensional Creep Damage Theory
References	21	Creep Damage Physics	21.1	Introduction
Loss of Internal Section	21.4	Degradation of Microstructure	21.5	Damage by Oxidation
References	22	Prediction of Creep Rupture Life	22.1	Extrapolation Methods of Creep Rupture Life
Projection Method	22.3	Maruyama Parameter	22.4	Reliability of Prediction for Creep Rupture Property
References	23	Creep-Fatigue Interaction	23.1	Creep Fatigue Waveforms
Failure Maps	23.3	Holding Time Effects on Creep-Fatigue Lifetime	23.4	Fracture Mechanics of Creep
Fatigue Crack Growth	References	24	Prediction of Creep-Fatigue Life	24.1
Accumulation Rule	24.2	Strain Range Partitioning	24.3	Damage Mechanics Method
Function Method	24.5	Empirical Methods	References	25
25.1	Oxidation	25.2	Hot Corrosion	25.3
			Carburization	References
				Appendix A
				Appendix B
				Index

## &lt;&lt;材料的高温变形与断裂&gt;&gt;

## 章节摘录

The correlation between  $K$  and the crack growth rate is poor for materials with good ductility. In addition, the stress intensity factor  $K$  cannot correlate the crack growth data obtained for different types of specimens of identical materials. Figure 19.10 (a) shows the crack growth rate plotted against stress intensity factor obtained from single edge notched (SEN) and notched center hole (NCH) specimens of a 316 stainless steel. The two types of specimen exhibit different  $a\sim K$  correlations. For instance, a single relationship is found for the SEN specimens, but the same relationship is not found for the NCH specimens. Instead, it shows great variations in growth rate for very slight changes in  $K$ . These observations indicate that the stress factor  $K$  is not the exclusive crack-tip parameter controlling the growth rate of creep crack. In fact, the stress intensity factor  $K$  is the fracture mechanics parameter which describes the elastic stress field and the elastoplastic stress field under small scale yielding conditions. In materials with low creep resistance and high creep ductility, the elastic stress field of the crack tip can be easily relaxed by the fast creep deformation, 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 stress field of the crack tip and the growth rate of creep crack in the ductile materials such as stainless steels, low-alloy steels and pure metals, etc. ....

## <<材料的高温变形与断裂>>

### 编辑推荐

The energy , petrochemical , aerospace and other industries all require materials able to withstand high temperatures. High temperature strength is defined as the resistance of a material to high temperature deformation and fracture. This important book provides a valuable reference to the main theories of high temperature deformation and fracture and the ways they can be used to predict failure and service life. Part I reviews the mechanisms of high temperature deformation in metals , alloys , metal matrix composites and intermetallic compounds. It discusses creep behaviour 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 creep crack 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 important reference for both academic researchers and those industry using these high temperature materials. Professor Jun-Shan Zhang works within the School of Materials Science and Engineering at Dalian University of Technology , China.

<<材料的高温变形与断裂>>

版权说明

本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问:<http://www.tushu007.com>