

奥氏体形成与 珠光体转变

Austenite Formation and Pearlite Transformation

刘宗昌 任慧平 王海燕 著

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内 容 提 要

本书全面阐述了奥氏体、珠光体的新概念、新理论、新机制,是最新的研究成果和理论,其显著特点是创新性。内容包括:导论,逆共析转变与奥氏体,珠光体的组织结构,过冷奥氏体共析分解机理,珠光体转变动力学,珠光体的力学性能及应用,表面浮凸。

本书适合研究院所、钢铁企业、大专院校从事钢的研究、钢材品种开发及教学的科研人员、技术人员及教学人员阅读参考。

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前 言

固态相变理论是金属热处理、铸造、焊接、锻压、轧钢、冶金等金属材料工程的技术理论基础,是材料科学与工程的重要理论支柱之一。本书介绍了奥氏体的形成、过冷奥氏体的共析分解等内容。奥氏体形成和珠光体转变是固态相变的两个分支学科,涉及的问题有相变热力学、动力学、晶体学、组织学、性能学及其应用等。本书在继承以往成熟理论的基础上,阐述了近年来国内外研究发展的新观察、新概念、新技术、新理论。

科学技术哲学指出:科学是以范畴、定理、定律形式反映现实世界多种现象的本质和运动规律的知识体系,是沿着“经验事实→假说→理论”的途径而发展的。概念是科学理论的细胞,可见概念极为重要。但科学概念的形成往往有个过程,初期观察、认识有片面性,则概念欠准确。随着科学研究的深入,通过科学抽象,搞清了事物的本质和内在规律性,则更新概念,促进理论进一步发展。

20 世纪上半叶对奥氏体的形成、共析分解进行了大量的研究工作,但某些问题尚未真正搞清,如珠光体的定义、共析分解机理等。本书作者依据对奥氏体、珠光体组织结构的新观察和理论研究,纠正了以往的概念,阐述了新机制,完善了奥氏体形成和珠光体转变理论。

本书主要特点有:

(1) 在阐述成熟的传统理论的同时,介绍了近年来国内外研究、发展的新理论,注意理论与实际相结合,推动理论和技术创新。

(2) 运用科学技术哲学理论,鲜明地阐述了作者的学术观点,研究提出了相关的新概念、阐述了新理论。

本书阐述的奥氏体形成和共析分解属于固态相变的重要应用理论,可供从事冶金、轧钢、铸造、锻压、焊接、热处理、粉末冶金以及材料开发研究等行业的科研人员、技术人员参考,也可作为金属材料工程等专业教师的教学参考书,可供本科生、研究生等学习阅读。

本书是采用继承与创新相结合的方法,综合介绍国内外的最新研究成果,为培养创新型人才而撰写的理论著作。全书内容由刘宗昌策划,

第1章由任慧平撰写、第2章由刘宗昌撰写、第3~7章由王海燕(博士)、刘宗昌合作撰写,李文学教授审阅。最后由刘宗昌负责全书的总成。王玉峰、计云萍、段宝玉等参加了相关的科研工作。

本书内容几经修改和补充,但仍然难免有疏漏和不完善之处,敬请读者指正。在撰写时参考并引用了一些书刊、论文资料的有关内容,谨此致谢。

作 者
2010年1月

Preface

Theory of solid state phase transformation is the important technical foundation for materials science and engineering, including metal heat treatment, casting, welding, forging, rolling, metallurgy, and so on. This book involves two branches of solid state phase transformation, i. e. austenite formation and super cooled austenite eutectoid decomposition, which comprise thermodynamics, kinetics, crystallography, microstructure, and performance science. In this book, new observations, new concepts and new theory in recent years was put forward based on the past theory research and development.

From the point of science and technology philosophy, science is the knowledge system developed according as the approach of experience, hypothesis to theory. It reflects a variety phenomena and nature of real world by means of theory and law. Definition is extremely important for scientific theory; the formation of scientific concepts is often a developing process. With the in-depth of scientific research, the nature of things and the inherent regularity was explained clearly, then the concept was updated, and the theory was promoted to make further develop.

First half of the 20th century, a lot of research work were carried out on the formation and eutectoid decomposition of austenite, however, some issues, such as pearlite definition and eutectoid decomposition mechanism, haven't really clearly yet. In this book, the author corrected previous wrong concept, explained the new mechanism based on the experimental observations and theoretical studies of austenite and pearlite microstructure.

Main features of this book are as follows. Firstly, elaborating the mature traditional theory, and new development as well, integrating theory and practice to promote the theory and technological innovation. Secondly, expounded the academic point of the author's, and put forward the relatively new concept and new theory of eutectoid decomposition by using science, technology, and philosophy theory.

It is all known that austenite formation and eutectoid decomposition are important theory for solid-state phase transformation, which can be provided for scientific and technical personnel who engaged in metallurgy, rolling, casting, forging, welding, heat treatment, powder metallurgy, and other field of materials research and development indus-

tries, and also can be used as reference books for teachers, undergraduate, graduate students in the field of metal material engineering and related professional.

In this book, inheritance and innovation methods were integrated, and the latest research results were constantly improved and updated for the training of innovative talents. The content of the book is planning and assembly by Professor Liu Zongchang. In addition, Professor Ren Huiping participated in the writing of Chapter 1, Ph. D. Wang Haiyan were responsible for the Chapter 3 to 7, the Chapter 2 were edited by Liu Zongchang, and Professor Li Wenxue reviewed this manuscript as well. Moreover, Wang Yufeng, Ji Yuping, Duan Baoyu had attended our research work.

The contents of this book was revised after several change and improvement, however, there may be still inevitable some omissions and imperfections, we really hoped readers give valuable opinion. In addition, a number of books and papers relating to the contents of this book were cited during edition, we also would like to thank those authors for providing the reference.

January 1, 2010

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Liu Zongchang

目 录

1 导论	1
1.1 铁基合金整合系统及相变的复杂性	1
1.1.1 钢的复杂系统	1
1.1.2 铁基合金整合系统	2
1.1.3 钢中相变的复杂性及自组织	2
1.1.4 多形性是固态相变多变的根源	4
1.2 扩散型相变中原子的迁移	4
1.2.1 扩散理论概要	4
1.2.2 原子迁移的热力学	11
1.2.3 实际金属中的扩散	11
1.3 固态相变热力学	14
1.3.1 相变热力学分类	14
1.3.2 相变过程的能量变化	15
1.4 固态相变动力学	18
1.4.1 形核率	18
1.4.2 Johnson-Mehl 方程	21
1.4.3 Avrami 方程	23
1.4.4 动力学曲线和等温转变图	24
参考文献	24
2 逆共析转变与奥氏体	25
2.1 奥氏体	25
2.1.1 奥氏体的组织形貌	25
2.1.2 奥氏体的晶体结构	26
2.1.3 奥氏体成分的不均匀性	27
2.1.4 奥氏体中的退火孪晶	28
2.1.5 奥氏体中的层错	29
2.1.6 奥氏体的性能	30
2.2 奥氏体形成机理	31

2.2.1 奥氏体形成的热力学条件	31
2.2.2 奥氏体的形核	32
2.2.3 奥氏体晶核的长大	36
2.2.4 渗碳体的溶解和奥氏体成分的相对均匀化	40
2.2.5 针形奥氏体和球形奥氏体的形成	41
2.2.6 亚共析钢的奥氏体化	42
2.2.7 过共析钢奥氏体的形成	45
2.3 奥氏体等温形成动力学	46
2.3.1 共析碳素钢奥氏体等温形成动力学	46
2.3.2 亚共析碳素钢的等温 TTA 图	46
2.3.3 连续加热时奥氏体的形成	47
2.3.4 奥氏体化曲线的比较	50
2.3.5 奥氏体的形核率和长大速度	50
2.3.6 影响奥氏体形成速度的因素	52
2.4 奥氏体晶粒长大	54
2.4.1 奥氏体晶粒长大现象	54
2.4.2 奥氏体晶粒长大机理	56
2.4.3 硬相微粒阻碍奥氏体晶界的移动	57
2.4.4 奥氏体晶粒及影响其长大的因素	59
2.4.5 粗大奥氏体晶粒的遗传性	60
2.5 奥氏体相区及合金元素的影响	62
2.5.1 铁的多形性转变	62
2.5.2 体心立方铁的热力学特征	63
2.5.3 合金钢中奥氏体化的特点	65
参考文献	66
3 珠光体的组织结构	67
3.1 珠光体的组织及定义	67
3.1.1 定义	67
3.1.2 珠光体的组织形态	68
3.1.3 珠光体的片间距	71
3.1.4 珠光体组织形貌的多样性与复杂性	73
3.2 珠光体的晶体学	74
3.2.1 珠光体与奥氏体的位向关系	75
3.2.2 珠光体团中铁素体与渗碳体的位向关系	75
参考文献	76

4 过冷奥氏体共析分解机理	77
4.1 奥氏体转变为珠光体的热力学	77
4.1.1 奥氏体与珠光体的自由能之差	77
4.1.2 共析分解的热力学条件	78
4.1.3 相变驱动力的计算模型	79
4.2 过冷奥氏体共析分解机理	79
4.2.1 晶体缺陷对形核的促进作用	80
4.2.2 珠光体的形核	82
4.2.3 珠光体晶核的长大	87
4.2.4 总结	92
4.3 钢中粒状珠光体的形成机理	93
4.3.1 析出相聚集粗化机理	93
4.3.2 析出相组织的粗化	94
4.3.3 获得粒状珠光体的途径	95
4.4 共析分解的特殊形式——相间沉淀	99
4.4.1 相间沉淀的热力学条件	99
4.4.2 相间沉淀产物的形态	100
4.4.3 相间沉淀机制	101
4.5 先共析铁素体的析出	104
4.5.1 亚共析钢中先共析铁素体的析出	104
4.5.2 先共析铁素体的析出速度	107
4.5.3 魏氏组织铁素体的形成	109
4.5.4 伪共析转变	111
4.6 先共析碳化物的析出	113
参考文献	115
5 珠光体转变动力学	117
5.1 过冷奥氏体转变动力学图	117
5.1.1 等温转变图	117
5.1.2 连续冷却转变图	120
5.2 退火用 C 曲线	121
5.2.1 典型工具钢的退火用 TTT 图	121
5.2.2 退火用 TTT 图、CCT 图的应用	124
5.3 钢的 TTT 图类型	125
5.3.1 类型一:共析分解与贝氏体相变曲线重叠	127

5.3.2 类型二:珠光体 TTT 与贝氏体 TTT 逐渐分离,形成海湾区	128
5.3.3 类型三:合金结构钢的贝氏体 TTT 曲线普遍在珠光体 TTT 的左方	130
5.3.4 类型四:渗碳后贝氏体转变 C 曲线右移	131
5.3.5 类型五:贝氏体转变 C 曲线严重右移直至消失	133
5.3.6 类型六:Cr-Ni-Mo 合金系中,珠光体的 C 曲线严重右移, 直至消失	134
5.4 影响过冷奥氏体共析分解的内在机制	135
5.4.1 奥氏体化状态	135
5.4.2 奥氏体溶碳量	136
5.4.3 奥氏体中合金元素的影响	136
5.4.4 合金奥氏体的系统整合作用	140
参考文献	144
6 珠光体的力学性能及应用	145
6.1 铁素体-珠光体的力学性能	145
6.1.1 钢铁材料的力学性能	146
6.1.2 珠光体的力学性能	146
6.1.3 铁素体+珠光体整合组织的强度	148
6.2 铁素体-珠光体组织的应用	149
6.2.1 珠光体钢的应用	149
6.2.2 铁素体-珠光体钢的应用	150
6.3 粒状珠光体组织及退火新工艺	152
6.3.1 决定退火钢硬度的要素	152
6.3.2 典型钢种锻轧材的球化退火	155
6.4 开发应用先进珠光体钢	161
6.4.1 细晶钢	161
6.4.2 高速车轮用钢	162
6.4.3 长寿命高性能弹簧钢	162
6.4.4 高性能冷锻钢	162
参考文献	163
7 表面浮凸	165
7.1 珠光体表面浮凸现象	165
7.1.1 珠光体表面浮凸的直接观察	165
7.1.2 珠光体浮凸的尺度	168

7.2 珠光体表面浮凸形成机制	169
7.3 魏氏组织表面浮凸	172
7.4 贝氏体、马氏体表面浮凸概述	174
7.4.1 贝氏体表面浮凸	175
7.4.2 马氏体的表面浮凸	175
7.5 表面浮凸与相变机制	176
参考文献	177
名词术语	179

Contents

1 Prologue	1
1.1 Complexity of Fe-based Alloy Integration Systems and Phase Transformation	1
1.1.1 Complexity of Steel	1
1.1.2 Fe-based Alloy Integration Systems	2
1.1.3 Self-organization and Complexity of Phase Transformation in Steel	2
1.1.4 Multi-morphic is the Root of Solid-state Phase Transformation	4
1.2 Atoms Migration in the Diffuse Phase Transformation	4
1.2.1 Summary of Diffusion Theory	4
1.2.2 Thermodynamics of Atomic Migration	11
1.2.3 Diffusion of the Actual Metal	11
1.3 Thermodynamics of Solid-state Phase Transformation	14
1.3.1 Phase Transformation Thermodynamics Category	14
1.3.2 Energy Change of the Phase Transformation	15
1.4 Solid-state Phase Transformation Kinetics	18
1.4.1 Nucleation Rate	18
1.4.2 Johnson-Mehl Equation	21
1.4.3 Avrami Equation	23
1.4.4 Kinetic Curve and Isothermal Transformation Diagram	24
References	24
2 Reverse Eutectoid Transformation and Austenite	25
2.1 Austenite	25
2.1.1 Austenite Morphology	25
2.1.2 Austenite Structure	26
2.1.3 Inhomogeneity of Austenite Composition	27
2.1.4 Annealing Twins in the Austenite	28
2.1.5 Stacking Fault in the Austenite	29
2.1.6 Performance of Austenitic	30

2. 2	Austenite Formation	31
2. 2. 1	Thermodynamic Conditions for the Austenite formation	31
2. 2. 2	Austenite Nucleation	32
2. 2. 3	Austenite Nuclei Growth	36
2. 2. 4	Cementite Dissolution and Uniformity of Austenite Composition	40
2. 2. 5	Formation of Needle-shaped Austenite and Spherical Austenite	41
2. 2. 6	Austenite of Eutectoid Steel	42
2. 2. 7	Austenite Formation of Hypereutectoid Steel	45
2. 3	Kinetics of Isothermal Formation of Austenite	46
2. 3. 1	Austenite Isothermal Formation Kinetics of Eutectoid Carbon Steel ..	46
2. 3. 2	Isothermal TTA Diagram of Hypoeutectoid Carbon Steel	46
2. 3. 3	Austenite Formation of during Continuous Heating	47
2. 3. 4	Comparison of Curves of Austenite	50
2. 3. 5	Nucleation Rate and Growth Rate of Austenite	50
2. 3. 6	Factors of the Formation Rate of Austenite	52
2. 4	Austenite Grain Growth	54
2. 4. 1	Austenitic Grain Growth Behavior	54
2. 4. 2	Austenite Grain Growth Mechanism	56
2. 4. 3	Hard-phase Particles Impede the Movement of Austenite Grain Boundary	57
2. 4. 4	Austenite Grain and Factors Affecting Their Growth	59
2. 4. 5	hereditary of Coarse Austenite Grain	60
2. 5	Effects of Austenite Phase Region and the Alloying Elements	62
2. 5. 1	The Multi-shape Changes of Iron	62
2. 5. 2	Thermodynamic Characteristics of Body-centered Cubic Iron	63
2. 5. 3	Austenitizing Characteristics in Alloy Steel	65
	References	66
3	Microstructure of Pearlite	67
3. 1	Microstructure and Definition of Pearlite	67
3. 1. 1	Definition	67
3. 1. 2	Morphologyof Pearlite	68
3. 1. 3	Pearlite-chip Spacing	71
3. 1. 4	Diversity and Complexity of the Pearlite Morphology	73
3. 2	Pearlite Crystallographic	74

3. 2. 1 Orientation Relationship between Pearlite and the Austenite	75
3. 2. 2 Orientation Relationship between Ferrite and Cementite in Pearlite Group	75
References	76

4 Eutectoid Decomposition Mechanism of

Undercooled Austenite	77
4. 1 Thermodynamics of Austenite into Pearlite	77
4. 1. 1 Free Energy Difference Between Austenite and Pearlite	77
4. 1. 2 Thermodynamic Conditions of the Eutectoid Decomposition	78
4. 1. 3 Phase Transformation Driving Force Calculation Model	79
4. 2 Eutectoid Decomposition Mechanism of Undercooled Austenite ...	79
4. 2. 1 Role of Crystal Defects on the Nucleation	80
4. 2. 2 Pearlite Nucleation	82
4. 2. 3 Pearlite Nuclei Growth	87
4. 2. 4 Summary	92
4. 3 Formation Mechanism of Granular Pearlite in Steel	93
4. 3. 1 Precipitate Coarsening Mechanism	93
4. 3. 2 Precipitate Coarsening	94
4. 3. 3 Way of Obtain Granular Pearlite	95
4. 4 Inter-phase Precipitate: A Special Form of Eutectoid Decomposition	99
4. 4. 1 Thermodynamic Conditions of Interphase Precipitation	99
4. 4. 2 Morphology of Interphase Precipitation Products	100
4. 4. 3 Interphase Precipitation Mechanism	101
4. 5 Eutectoid Ferrite Precipitation	104
4. 5. 1 Eutectoid Ferrite Precipitation in Hypoeutectoid Steel	104
4. 5. 2 Eutectoid Ferrite Precipitation Rate	107
4. 5. 3 Ferrite Formation of Widmanstätten Microstructure	109
4. 5. 4 Pseudo-eutectoid Transformation	111
4. 6 Eutectoid Carbide Precipitation	113
References	115

5 Pearlite Transformation Kinetics

5. 1 Undercooled Austenite Transformation Kinetics Diagram	117
5. 1. 1 Isothermal Transformation Diagram	117

5. 1. 2	Continuous Cooling Transformation Diagram	120
5. 2	Annealing TTT Curve	121
5. 2. 1	Annealing TTT Diagram of the Typical Tool Steel	121
5. 2. 2	Application of Annealing TTT Diagram and CCT Diagram	124
5. 3	TTT Diagram Type of Steel	125
5. 3. 1	Type 1 ;Overlapping of Eutectoid Decomposition and Bainitic Transformation Curves	127
5. 3. 2	Type 2 ;Pearlite TTT and Bainite TTT Gradually Separated to Form a River Bend District	128
5. 3. 3	Type 3 ;Bainite TTT Curve is Commonly at the Left of Pearlite in Alloy Structural Steel	130
5. 3. 4	Type 4 ;Bainite Transformation C Curve Shifted to the Right after Carburizing	131
5. 3. 5	Type 5 ;Bainite Transformation C Curve Shift to the Right until Disappears	133
5. 3. 6	Type 6 ;Pearlite Transformation C Curve Shift to the Right until Disappears in Cr-Ni-Mo Alloy System	134
5. 4	Internal Mechanism Affecting the Eutectoid Decomposition of Supercooled Austenite	135
5. 4. 1	Austenitizing State	135
5. 4. 2	Dissolved Carbon Amount of Austenite	136
5. 4. 3	Effects of Alloying Elements in Austenite	136
5. 4. 4	Integration Role of the Austenitic Alloy System	140
	References	144
6	Mechanical Properties and Applications of Pearlite	145
6. 1	Mechanical Properties of Ferrite-pearlite	145
6. 1. 1	Mechanical Properties of Steel	146
6. 1. 2	Mechanical Properties of Pearlite	146
6. 1. 3	Strength of Ferrite Combining with Pearlite	148
6. 2	Application of Ferrite-pearlite Steel	149
6. 2. 1	Application of Pearlite Steel	149
6. 2. 2	Application of Ferrite-pearlite Steel	150
6. 3	Granular Pearlite Microstructure and Annealing New Process	152
6. 3. 1	Factor of of Annealed Steel Hardness	152

6.3.2 Spheroidization Annealing of Forged and Rolled Typical Steel	155
6.4 Development and Application of Advanced Pearlite Steel	161
6.4.1 Fine Grain Steel	161
6.4.2 High Speed Wheel Steel	162
6.4.3 High Performance Long-life Spring Steel	162
6.4.4 High Performance Cold Heading Steel	162
References	163
7 Surface Relief	165
7.1 Pearlite Surface Relief	165
7.1.1 Direct Observation of Pearlite Surface Relief	165
7.1.2 Pearlite Surface Scale	168
7.2 Pearlite Surface Relief Formation Mechanism	169
7.3 Widmanstatten Microstructure Surface Relief	172
7.4 Overview of Bainite and Martensite Surface Relief	174
7.4.1 Bainite Surface Relief	175
7.4.2 Martensite Surface Relief	175
7.5 Surface Relief and Phase Change Mechanism	176
References	177
Terminology	179