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Metals Handbook[®]
Ninth Edition

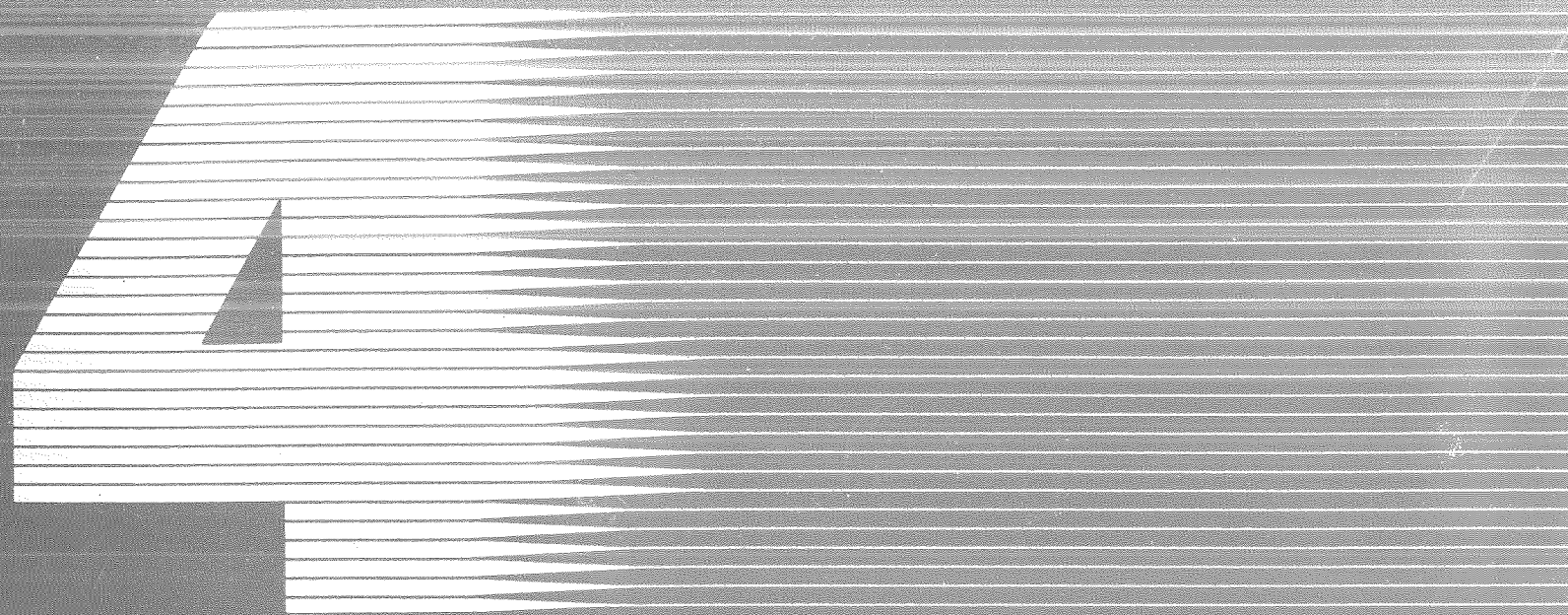
Volume 4
Heat Treating

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Heat
Treating

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 American Society for Metals

Metals Handbook[®] Ninth Edition

Volume 4 Heat Treating

Prepared under the direction of
the ASM Handbook Committee

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and reviewed by
the ASM Heat Treating Division
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Metals Handbook is a collective effort involving thousands of technical specialists. It brings together in one book a wealth of information from world-wide sources to help scientists, engineers and technicians solve current and long-range problems.

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Foreword

For the first twenty years of its life, the American Society for Metals focused solely on heat treating. Launched in 1913 in Detroit as the Steel Treating Club, the group amalgamated with the American Steel Treating Society to form the American Society for Steel Treating in 1920. A final name change to American Society for Metals in 1933 completed the transition from a society concerned primarily with heat treating to a society with far-ranging interests in a variety of metals topics.

Although almost a half-century has passed since this momentous change, heat treating has remained an area of deep interest and concern to ASM members. Indeed, heat treating is one of the foundations of the metals sciences and, therefore, of the Society.

Continued leadership of ASM in addressing this fundamental topic is demonstrated by the publication of Volume 4 of the 9th Edition of the Metals Handbook. An earlier volume in the 8th Edition dealt, in part, with heat treating. New Volume 4 reflects a significant expansion in subject coverage, consistent with a growing

technology.

Mere volume of information, however, is by no means the sole criterion. With leadership comes a responsibility to match, and hopefully exceed, the usefulness and high technical standards established by the earlier volume. In this respect, new Volume 4 is innovative in a way that contributes to the scope and comprehensiveness of information presented. Every single article has been planned, organized, prepared, and reviewed by members of the ASM Heat Treating Technical Division, expert contributors with "hands on" experience in the many facets of heat treating technology.

The traditional quality of the Metals Handbook depends heavily on the efforts and talents of many people. In this volume, members of the Heat Treating Technical Division played a major role, but a full and rich share of the credit should go to the members of the ASM Handbook Committee for their continuing efforts, to individual contributors, and to the editorial staff. For their valuable contributions, we express our thanks and our gratitude.

John B. Giacobbe
President

Allan Ray Putnam
Managing Director

The Ninth Edition of Metals Handbook
is dedicated to the memory of
TAYLOR LYMAN, A. B. (Eng.), S. M., Ph. D.
(1917-1973)
Editor, Metals Handbook 1945-1973

Preface

Since the days of the ASM parent organization, American Society for Steel Treating, and the publication of its first Handbook in 1924, heat treating has played a very significant and ever-broadening role within the technical community. Traditionally, ASM has served as the leader in the gathering and dissemination of heat treating information in support of engineering and manufacturing needs. The publication of this Handbook on heat treating, Volume 4, Ninth Edition, is the latest offering in fulfillment of ASM's continuing responsibility.

Over the years, interest and activity in heat treating have continued to increase, both in volume and scope. This becomes evident by comparing the size of the 1948 Metals Handbook, containing approximately 100 pages of heat treating related articles to the 1964 Volume 2, which included 300 pages of heat treating information. Volume 4 is the largest

yet, consisting of 800 pages of practical and easy to use information on the subject of heat treating.

Part of this increase results from the inclusion of new subject matter. Articles on fluidized bed processes, vacuum carburizing, microprocessors, laser and electron-beam heat treating are some of the new subject matter that reflects recent advancements in technology. In addition, sections on gas carburizing, furnace atmospheres, flame hardening, and heat treating of aluminum have been expanded appreciably. This new and updated information provides the reader with a comprehensive, useful, and technically reliable reference to current heat treating processes and related equipment.

One major innovation in the preparation of Volume 4 is the manner by which the contents were planned, organized, prepared, and reviewed. For the first time, these activities were put in motion and

accomplished through the efforts of the ASM Heat Treating Technical Division. Members of the Heat Treating Division Council, each reflecting expertise in his particular area of interest, responded by supervising and participating in the preparation of appropriate manuscripts. Refinements and corroboration of their input was effected through review by a peer group—also members of the Heat Treating Division. The end result of this concerted effort, Volume 4, reflects the practical "hands on" experience and technical competence of these expert contributors.

As in past volumes of the Handbook, ASM expresses appreciation for the collective experience, skill, knowledge and dedication of the contributors, reviewers, and consulting editors to produce a book of such stature. They have earned the gratitude of the entire metallurgical community for their unselfish efforts.

James R. Easterday
Coordinator
Metals Handbook Activity
Heat Treating Division

Contents

Heat Treating of Steel.....	1	Furnace Control Instrumentation	343	Heat Treating of Stainless Steels and Heat-Resisting Alloys	621
Stress-Relief Heat Treating of Steel	3	Temperature Control	345	Heat Treating of Stainless Steels	623
Normalizing of Steel	6	Atmosphere Control	361	Stress Relieving of Austenitic Stainless Steels	647
Annealing of Steel	14	Computerized Systems for Heat Treating	367	Heat Treating of Heat-Resisting Alloys.....	650
Austenitizing Temperatures for Hardening Carbon and Low-Alloy Steels	28	Furnace Safety.....	378		
Quenching of Steel	31	Furnace Atmospheres and Carbon Control.....	387	Heat Treating of Nonferrous Metals.....	673
Tempering of Steel	70	Furnace Atmospheres.....	389	Heat Treating of Aluminum Alloys.....	675
Martempering of Steel	85	Control of Surface Carbon Content in Heat Treating of Steel.....	417	Heat Treating of Copper Alloys.....	719
Austempering of Steel	104	Evaluation of Carbon Control in Processed Parts	432	Heat Treating of Lead and Lead Alloys.....	740
Cold Treating of Steel.....	117	Localized Heat Treating.....	449	Heat Treating of Magnesium Alloys.....	744
Heat Treating of Ultrahigh-Strength Steels.....	119	Induction Hardening and Tempering.....	451	Heat Treating of Nickel and Nickel Alloys	754
Heat Treating of Maraging Steels	130	Flame Hardening	484	Annealing of Precious Metals	760
		Laser Surface Transformation Hardening.....	507	Heat Treating of Titanium and Titanium Alloys.....	763
Case Hardening of Steel	133	Electron-Beam Heat Treating...	518	Heat Treating of Tin-Rich Alloys	775
Gas Carburizing	135	Heat Treating of Cast Irons	523	Heat Treating of Special-Purpose Alloys.....	777
Carbonitriding	176	Introduction to Heat Treating of Cast Irons	525		
Gas Nitriding	191	Heat Treating of Gray Irons.....	529	Heat Processing of Powder Metallurgy Parts.....	791
Pack Carburizing.....	222	Heat Treating of Ductile Irons.....	545	Sintering.....	793
Liquid Carburizing and Cyaniding	227	Heat Treating of Malleable Irons.....	552	Heat Treating of Ferrous Powder Metallurgy Parts.....	798
Liquid Nitriding	250	Heat Treating of Austenitic Irons.....	556		
Gaseous Ferritic Nitrocarburizing	264	Heat Treating of Tool Steels.....	559	Système Internationale d'Unités (SI)	801
Vacuum Carburizing.....	270	Introduction to Heat Treating of Tool Steels.....	561	Abbreviations and Symbols	802
Methods of Measuring Case Depth	275	Processes and Furnace Equipment for Heat Treating Tool Steels.....	575	Index.....	804
		Specific Classes of Tool Steels	581		
Heat Processing Equipment.....	283	Control of Distortion in Tool Steels	614		
Types of Heat Treating Furnaces	285				
Salt Bath Equipment	293				
Fluidized-Bed Equipment.....	299				
Heat Treating in Vacuum Furnaces and Auxiliary Equipment	307				
Heat-Resistant Alloys for Furnace Parts, Trays and Fixtures.....	325				
Energy-Efficient Operations	337				