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SOCIETY

ASM Handbook Series on Heat Treating Expands to Four Volumes

The recently-released *Steel Heat Treating Fundamentals and Processes* is the first of four upcoming ASM Handbooks on Heat Treating. Under the direction of an editorial team, including Jon Dossett and George Totten as Volume Editors, Volume 4A includes extensive updates and additions for all major topics such as furnace atmospheres, vacuum systems, atmosphere control, gas carburizing, vacuum carburizing, gas nitriding and nitrocarburizing, plasma nitriding, quenching, and tempering (Figs. 1, 2, 3, and 4).

Additional volumes scheduled for publication include:

- *Heat Treating of Irons and Steels* (Volume 4B, 2014) covering heat treating of specific ferrous materials and component applications. Volume Editors: Jon Dossett and George Totten with a team of Division Editors
- *Induction Heating and Heat Treatment* (Volume 4C, 2014) covering all major aspects of induction science, technology, and applications. Volume Editors: Valery Rudnev and George Totten with a team of Division Editors
- *Heat Treating of Nonferrous Alloys* (Volume 4D, 2015)

These volumes update and expand *ASM Handbook,* Volume 4*, Heat Treating*, which was published in 1991.

Coverage in Volume 4A will include several topics with new stand-alone articles on:

- Microstructural analysis of heat treated steels
- Hardenability calculation of carburized steels
- Cleaning of steels for heat treatment
- Austenitizing, direct quenching, and quenching and partitioning
- Fundamentals of carburizing, high-temperature carburizing, and stop-off technologies
- Fundamentals of nitriding and nitrocarburizing
- Furnace controls, induction systems, probes for quench characterization, and quench agitation and system design
- Articles on specific quench processes such as: gas quenching, coat forming, inverse hardening, salt quenching, fluidized-bed quenching, water–gas quenching, die quenching, press quenching, and patenting

Volume editors Jon Dossett and George Totten said, "Articles on the fundamentals provide in-depth background on the scientific principles associated with steel heat treatment, while articles on the various heat treating processes take a more practical approach. Many sections have been expanded, such as the sections on fundamentals and processing methods for carburizing and nitriding of steels. Coverage on the hardenability of steels is expanded, and several new articles have been added on quenching fundamentals and processes."

Steven Lampman, content developer, Reference Publications, ASM International, said a highlight of the new volume is the article "Fundamentals of Nitriding and Nitrocarburizing" by E.J. Mittemeijer. Lampman described the article as "worth the book price for those who care about fundamentals." The article covers the following:

- Advent of Nitriding
- Nitrided/Nitrocarburized Microstructure, Thermodynamics, and Kinetics
- The Iron–Nitrogen Phase Diagram
- Nitriding Potential and the Lehrer Diagram
- Controlled Nitriding
- Carburizing Potential and Controlled Carburizing
- Controlled Nitrocarburizing
- Local Equilibria and Stationary States

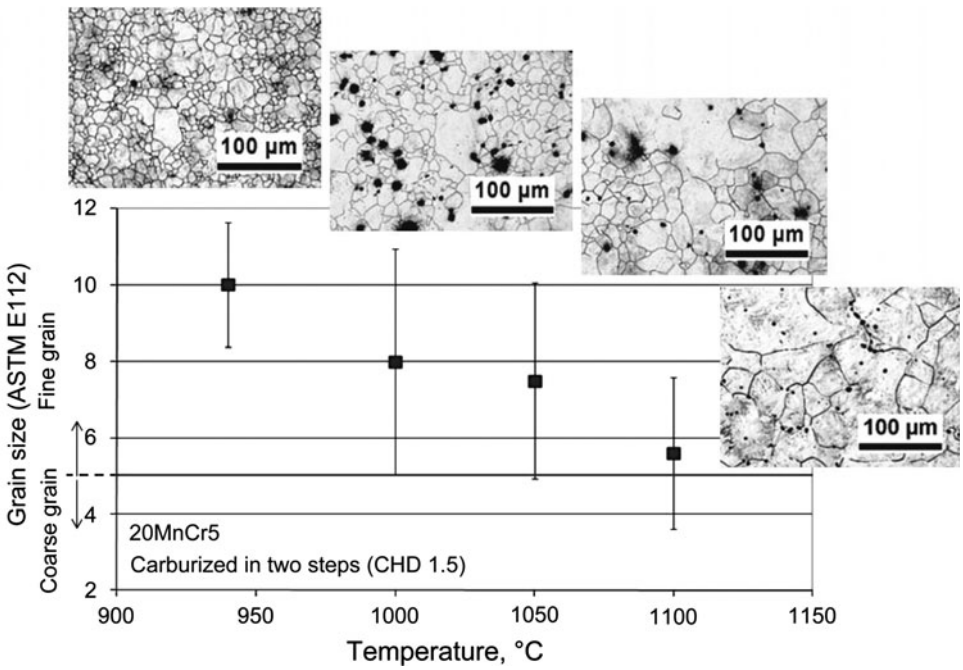

Fig. 1 Grain growth in conventional carburizing steels with increasing carburizing temperature. From the article "Plasma Carburizing" by Brigitte Clausen and Winfried Gräfen

- Microstructural Development of the Compound Layer
- Kinetics of Compound-Layer Growth
- Microstructural Development of the Diffusion Zone
- Kinetics of Diffusion-Zone Growth

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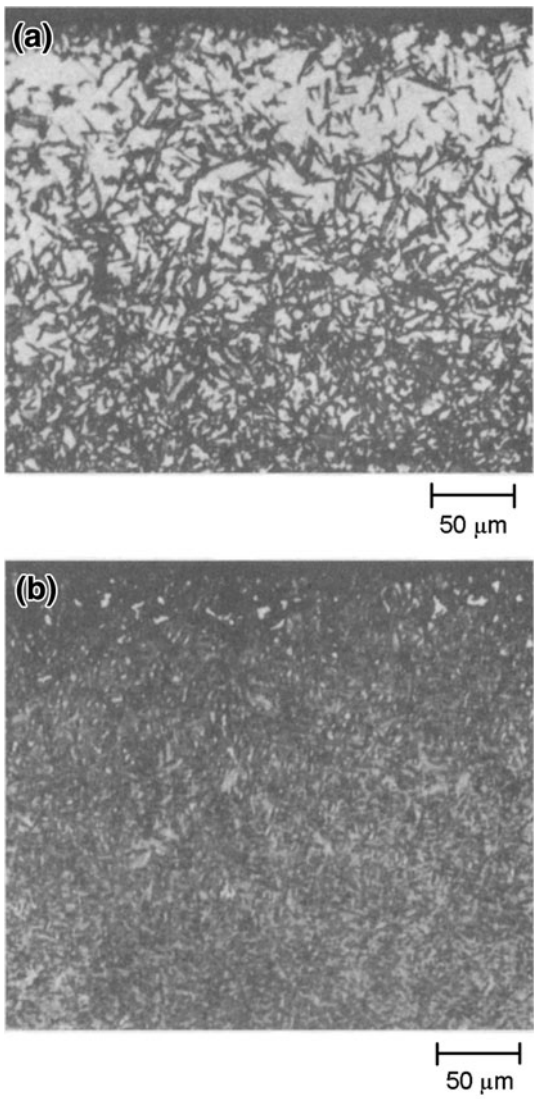

Fig. 2 Effect of low-temperature hold on retained austenite in carbonitrided 8617 steel bar. (**a**) Carbonitrided 4 h at 845 °C (1550 °F) in 8% ammonia, 8% propane, and remainder endothermic gas. Oil quenched and tempered 1.5 h at 150 °C (300 °F). Structure is tempered martensite (*dark*) and retained austenite. (**b**) Carbonitrided and tempered 8617 bar as in (**a**), except held 2 h at −75 °C (−100 °F) between quench and tempering. The structure is scattered carbide in a matrix of tempered martensite. Most of the retained austenite was transformed during low-temperature hold. Both 3% nital etch. Original magnification: ×200. From the article "Carbonitriding of Steels" by Jon Dossett

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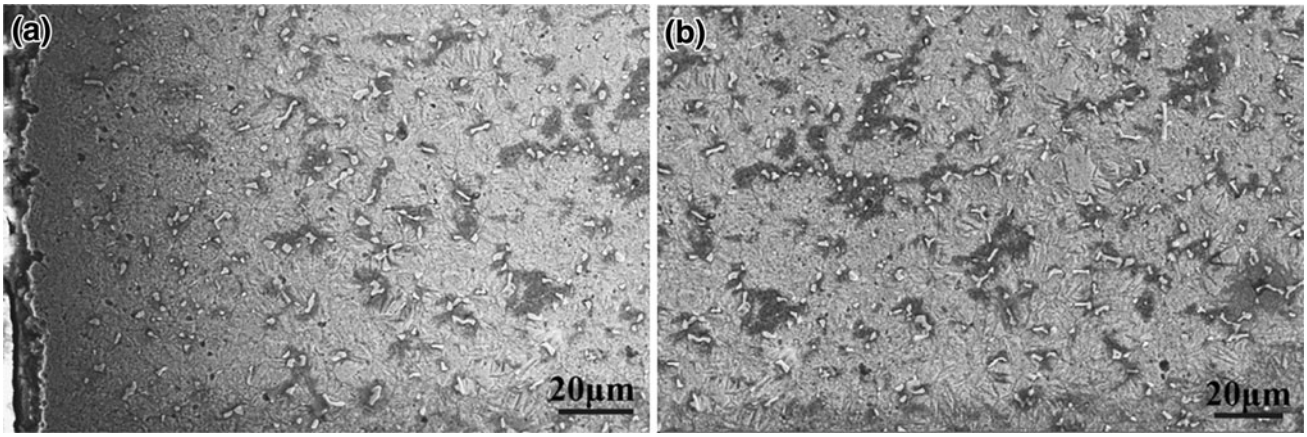

Fig. 3 Scanning electron microscope images of (**a**) the surface, and (**b**) the inside of the supercarburized layer treated by quenching and tempering. From the article "Supercarburizing" by J.Y. Shi

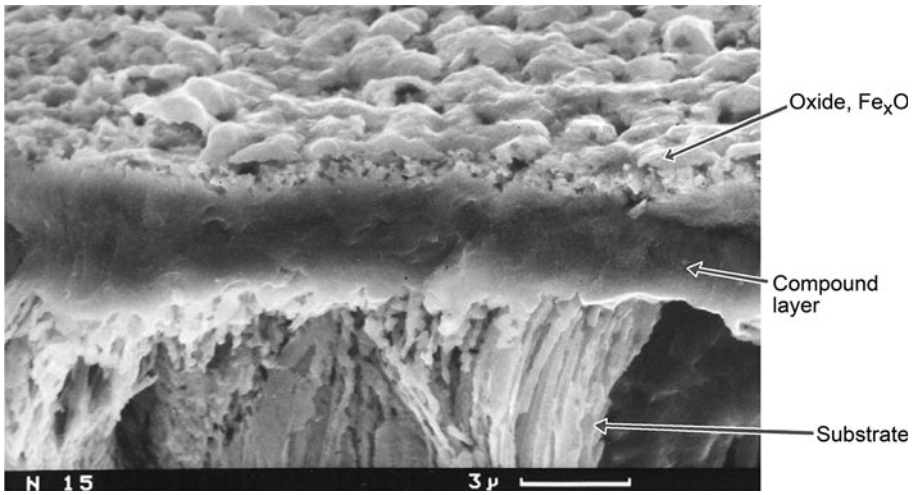

Fig. 4 Nitrided and postoxidized C15. Oxidation just began; iron oxides partially cover the porous compound layer below. Courtesy of IWT Bremen, Germany. From the article "Gas Nitriding and Gas Nitrocarburizing of Steels" by K.-M. Winter and J. Kalucki

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