Book Review



Introduction to Metal Ceramic Technology, 2nd Edition



By Patrick Naylor; contributions by Arlo H. King. Quintessence Publishing Co., Inc., Hanover Park, IL, 2009: ISBN 978-0-86715-460-3 (232 pages; 492 mostly color illustrations; price \$98.00).

This second edition to Dr. Navlor's very successful earlier text on metal-ceramic technology is targeted specifically to dental technology students, dental students, and graduate students. In the 17 years since the first edition was published, there are still few publications providing this fundamental information on the process of fabricating metal-ceramic restorations. Dr. Naylor's text with beautiful step-by-step color illustrations fills a needed void in our dental literature and, specifically, the field of dental technology. He has updated and revised each chapter, bringing the reader up to date on current technology and the most contemporary dental porcelain products. In support of dentistry's emphasis on evidence-based practices, each chapter concludes with a comprehensive list of references from both peer-reviewed journals and noteworthy textbooks. After many references, he provides a short synopsis of key elements of the article or text. Also new is information on biocompatibility and allergic responses, explanations of various substructure designs, expanded tables providing both the composition and physical properties of 65 metal-ceramic alloys, current classifications of dental porcelains and alloys, and a number of firing schedules for current products. Dr. Naylor includes the preface to his first edition, in which he points out that "the skill of physically constructing an esthetic restoration is an art, but additionally, understanding the rationale for the processes involved requires knowledge of the true science of dental technology." Dr. Naylor's text thoroughly details both of these critical elements involved in fabricating a functional, esthetic, and successful metal-ceramic restoration.

This book contains nine chapters, a glossary of terms, and six appendices. In Chapter 1, the reader is presented with the fascinating history and origins of modern-day dental ceramics. We are walked from 23,000 BC Asia to 18th century Europe and finally to 21st century America, where a recent survey found that 65% of 330,000 crowns fabricated in a 6-month period were metal-ceramic restorations.¹ In the last part of the chapter, the author explains the components that make up the metal-ceramic restoration: metal substructure, oxide layer, opaque porcelain layer, dentin porcelain veneer, enamel porcelain veneer, and external glaze.

Chapter 2 discusses the chemistry of dental porcelain, and the author does a wonderful job explaining the oftenmisunderstood terms: glass, glass-ceramic, dental ceramic, porcelain, and dental porcelain. Additionally, he reviews four methods of classifying dental ceramics and describes the chemical components of dental porcelain and the low-fusing porcelains used in metal-ceramic restorations: the opaque porcelains and their three primary functions, the body porcelains (dentin, enamel, translucent, and body modifiers), and finally the stains and glazes. The final part of the chapter is a review of some of the optical properties of modern dental porcelains, namely, fluorescence, metamerism, and opalescence.

Chapter 3 reviews casting alloys and discusses mechanisms for bonding to dental porcelain. Composition and physical properties of over 60 common alloys are provided along with several classification systems for these alloys. The high-noble metal, noble-metal, and predominantly base-metal alloys are all discussed, along with a review of the roles of their constituent elements. A comprehensive table that nicely presents 34 roles for 22 constituent elements within dental alloys is included. The author addresses biocompatibility, with emphasis on intraoral and extraoral manifestations of allergic response to constituent elements such as nickel and beryllium. Finally, he highlights the potential of laboratory technicians' occupational exposure to these same alloy constituents, as well as to laboratory dust.

In Chapter 4, the author covers metal substructure design and reviews five important principles: (1) Will the occlusal contacts be restored in metal or porcelain? (2) Are the centric occlusal contacts 1.5 to 2.0 mm from the porcelain-metal junction? (3) Are the interproximal contacts to be restored in metal or porcelain? (4) Are the cusp tips adequately supported by the metal substructure with no more than 2.0 mm of unsupported porcelain? (5) Is the substructure of adequate thickness to provide a rigid, inflexible foundation for the porcelain veneer? The rest of the chapter thoroughly covers anterior and posterior single and multiunit restoration substructure design, and Dr. Naylor clearly and succinctly gives descriptions, combined with beautiful photographs and illustrations, of each step in the process.

Chapter 5 reviews the many fundamentals of spruing, investing, and casting. Using a 3-unit fixed dental prosthesis (FDP) as an example, the author reviews each of the "17 Laws of Casting" first introduced in his 1992 text. As with other rules or guidelines, he points out that "there are penalties when these laws are not followed." Chapter 6 discusses the four theories proposed to explain how porcelain actually bonds to metal: van der Waals forces, mechanical retention, compression bonding, and direct chemical bonding. He also covers the oxidation process, postoxidation, and the typical porcelain-metal bond failures.

Chapter 7 is another chapter with excellent photographs, pictorials, and well-written descriptions of the process of preparing the metal substructure for porcelain application. The author covers the correct techniques of metal finishing and shows which types of burs and stones the technician should use. In the last part of the chapter, Dr. Naylor gives a thorough description of the soldering process, again with pictures showing each step in the process.

A highlight of the text is Chapter 8, with superb coverage of the process of applying porcelain to the metal substructure. Everything from brushes and instruments to porcelain furnaces is covered. Using a single-unit restoration and a 3-unit FDP, he walks the reader through each step of the process of porcelain application. In the last chapter, Dr. Naylor not only explains how to properly adjust, finish, and polish the metal-ceramic restoration, but he also gives an excellent review of the fundamentals of color science, along with the principles of color characterization and glazing.

At the end of this text, Dr. Naylor provides a comprehensive glossary for metal-ceramic technology along with six appendices: A. Dental Porcelain Firing Schedules; B. Celsius-Fahrenheit Conversion Chart; C. Percentage Composition of Historical Metal-Ceramic alloys; D. Wax Pattern-Alloy Conversion Tables; E. List of Equipment, Instruments, and Materials; and F. List of Manufacturers and Distributors.

For all interested in dental technology, but especially dental students, prosthodontic residents, and dental technicians, this is a highly recommended and *must-have* book for their libraries. It is an easily readable text that provides a wealth of information in a format for those who learn best through visual learning or through descriptive explanations. The comprehensive literature reviews at the end of each chapter provide further sources for more in-depth information. We should all be grateful to Dr. Naylor for his interest and dedication in providing this truly needed resource to our dental profession.

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Reference

1. Christensen GJ: The confusing array of tooth-colored crowns. J Am Dent Assoc 2003;134:1223–1255.

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