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Preface

Most people are familiar with corrosion in some form or another. Whether it is a rusty nail in a backyard fence, corroded fenders and/or mufflers on our automobiles, or a perforated underground water pipe, it is safe to say that corrosion is all around us. It is costly to prevent or repair, and it is generally not pleasing to look at. In the industrial workplace, corrosion is certainly one of the most common causes of failure of engineered components and structures. The complexities of corrosion phenomena challenge corrosion scientists, chemists, mechanical, civil, and metallurgical engineers, coating specialists, and maintenance and operating personnel.

In order to better understand corrosion, it is important to first examine the basic concepts that influence the corrosion process; hence, the title of this publication—Corrosion: Understanding the Basics. Included in these 12 chapters are practical discussions on the following:

- Thermodynamic and electrochemical principles of corrosion
- Recognition and prevention of various forms of corrosion
- Types of corrosive environments commonly encountered and environmental variables that can increase or decrease corrosion rates
- Corrosion characteristics of metals and alloys and nonmetallic materials
- Methods of corrosion prevention, including design considerations, materials selection, coatings, inhibitors, and cathodic and anodic protection
- Corrosion testing and monitoring
- Techniques for diagnosing corrosion failures
Although the book is primarily intended for professionals who are not corrosion experts, it should also serve as a quick and useful corrosion-control guide for corrosion engineers.

Assisting in the preparation of this book was Larry Korb from Rockwell International. Larry, who is a Fellow of ASM International and longtime member and former chairman of the ASM Handbook Committee, meticulously reviewed each chapter. I have long been in awe of my friend’s exhaustive knowledge of materials and their failure mechanisms (including corrosion), and his keen insight into the editorial process. It is always an honor and a privilege to work with Mr. Korb.

I also wish to acknowledge the contributions of Nalco Chemical Company (Naperville, IL). Many of the photographs illustrating the different modes of corrosion were supplied by Nalco. These originally appeared in two excellent books on failure analysis authored by Nalco engineers Harvey M. Herro (an ASM member) and Robert D. Port. I am indebted to Ms. Connie Szewczyk, a Communications Specialist with Nalco, for supplying these photographs.

Thanks are also extended to Kenneth B. Tator and Alison B. Kaelin from KTA-Tator Inc. (Pittsburgh, PA). Ken supplied an extensive table that reviewed the advantages and limitations of organic coating resins. Alison prepared material on environmental, health, and safety considerations for the coatings industry. Their contributions appear in Chapter 9.

The efforts of the ASM staff are also duly noted. In particular, I would like to thank Scott Henry and Bonnie Sanders from the Publications Department and Eleanor Baldwin and her coworkers from the ASM Library for the help and support throughout the project.

Last, I would be remiss in not acknowledging the fact that several chapters in the book were adapted from the ASM Materials Engineering Institute (MEI) course on corrosion that was prepared by Dr. Joe H. Payer from Case Western Reserve University (Cleveland, OH). Chapters 2 and 3, as well as the description of electrochemical test methods in Chapter 11, were based on Dr. Payer’s work.

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