

Preface

This book is concerned with the fundamentals of the corrosion of metallic materials and electrochemistry in order to better understand the phenomena of corrosion. Corrosion is related to both the environment and a material's properties—induced by electrochemical reactions at the interface between metallic materials and the environment, in aqueous and gaseous phases. In order to understand the phenomena of corrosion, knowledge of electrochemistry is therefore required. Appropriate electrochemical experiments must be performed to investigate the damage caused by corrosion. Corrosion scientists therefore need to possess knowledge of both electrochemistry and experimental techniques.

In this book we start with the fundamentals of corrosion and electrochemistry, and then describe some specific themes of corrosion. We believe that this book is accessible to both undergraduate students as well as graduate students who are beginning corrosion research.

In this book, in Chap. 1, an overview of the phenomena of corrosion is introduced from an electrochemical point of view. The electrochemical thermodynamics of equilibrium, as well as the kinetics of corrosion, are described in Chap. 2. In Chap. 3, a quantitative analysis method is described for the products resulting from corrosive reactions, in which in situ optical techniques, combined with electrochemical techniques and ex situ electron spectroscopic techniques in a vacuum, are introduced. The additional three chapters are concerned with specific themes linked to atmospheric corrosion (Chap. 4), hydrogen absorption inducing hydrogen embrittlement (Chap. 5), and micro-electrochemistry applied to heterogeneous corrosion using peculiar electrochemical techniques (Chap. 6).

The original version of this book was published in Japanese as a series: “Tutorial Electrochemical Method-5. Fundamentals of Corrosion Engineering and its Measurement” in the journal of *Electrochemistry*, published by the Electrochemical Society of Japan.

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We sincerely appreciate the Electrochemical Society of Japan allowing the publication of this English version. For publication in English, we reviewed the Japanese version, improved its content, and added a new topic about the micro-electrochemical approach to the study of corrosion.

Sapporo, Japan

Tokyo, Japan

Sapporo, Japan

Sapporo, Japan

Toshiaki Ohtsuka

Atsushi Nishikata

Masatoshi Sakairi

Koji Fushimi

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Ohtsuka, T.; Nishikata, A.; Sakairi, M.; Fushimi, K.

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