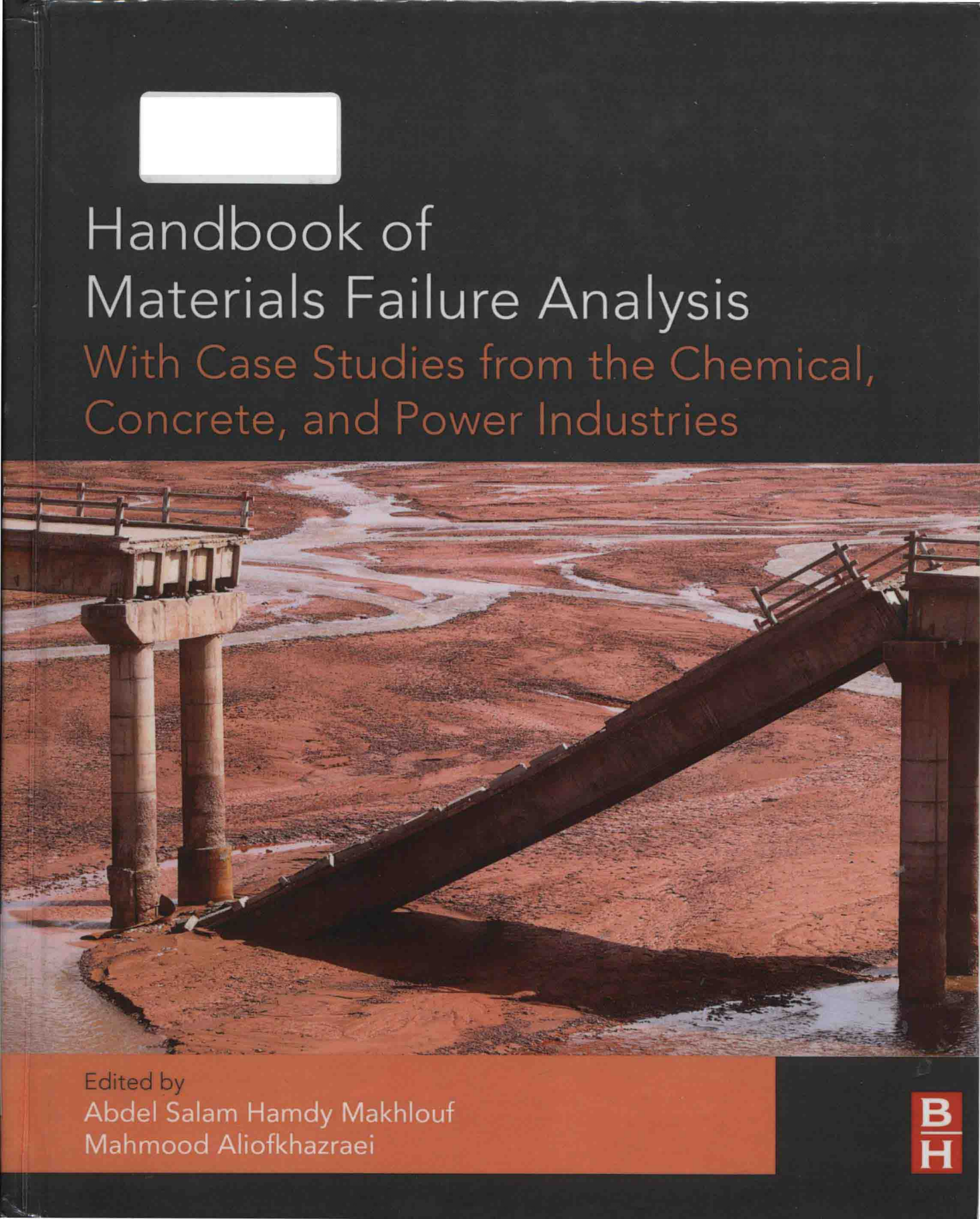




Handbook of Materials Failure Analysis

With Case Studies from the Chemical,
Concrete, and Power Industries

Edited by
Abdel Salam Hamdy Makhlouf
Mahmood Aliofkhazraei



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This handbook covers the most common cases of failure and their investigation, analysis, and possible remedy in the chemicals, concrete, and power industries.

- Introduces readers to modern analytical techniques in materials failure analysis
- Combines foundational knowledge with current research on the latest developments and innovations in the field
- Includes many compelling case studies of materials failure in chemical processing plants, concrete structures, and power generation systems

About the handbook:

This handbook provides an in-depth examination of materials failure in specific situations, a vital component in both developing and engineering new solutions. It covers analysis of materials failure in the chemical, power, and structures arenas, where the failure of a single component can result in devastating consequences and costs. Material defects, mechanical failure as a result of improper design, corrosion, surface fracture, and other failure mechanisms are described in the context of real-world case studies involving steam generators, boiler tubes, gas turbine blades, welded structures, chemical conversion reactors, and more. This book is an indispensable reference for engineers and scientists studying the mechanisms of failure in these fields.

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Preface

Failure in different industries can happen in segments of the machines when dynamic loading occurs. When you think about fatigue, you may think of an aerial ladder, the crankshaft of an automobile, or the wing of a plane. For failure analysis of the segments structure, we need mechanical examinations. For example, to predict the lifetime of a spring of a garage door, it should be clear that how much load is applied to the spring. Also, it should be clear how many times this force is applied, for example over a period of one year, on the spring. Using analytical methods and computer modeling methods, it can be predicted after how many cycles the fatigue phenomenon will occur in the spring. After comparison between the results of the fatigue test and the computer modeling, the validity of the model can be investigated. Using fractography, it can be made clear whether or not a fracture happened due to the fatigue. Fractography is the act of investigating the fracture surface, using a microscope.

This handbook provides an in-depth examination of materials failure in specific situations, a vital component in both developing and engineering new solutions. It covers analysis of materials failure in the areas of chemicals, power, and structures, wherein the failure of a single component can result in devastating consequences and costs. Material defects, mechanical failure as a result of improper design, corrosion, surface fracture, and other failure mechanisms, are described in the context of real-world case studies involving steam generators, boiler tubes, gas turbine blades, welded structures, chemical conversion reactors, and more. This book is an indispensable reference for engineers and scientists studying the mechanisms of failure in these fields.

This handbook contains many real-world failure cases and case studies covering a wide spectrum of materials failure related to chemicals, concrete, and power applications. The editors thank all the contributors for their excellent chapter contributions to this handbook, and for their hard work and patience during preparation and production of the handbook. We sincerely hope that the publication of this handbook will help people from Industry and Academia to get the maximum benefits from the experience contained in the published chapters.

Summer 2015

**Abdel Salam Hamdy Makhlouf
Mahmood Aliofkhazraei**

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