

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the CORROSION HANDBOOK** XI

**Sodium Hydroxide** 1

Author: P. Drodten / Editor: R. Bender

**A Metallic materials** 23

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 150

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 171

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 188

Coatings and linings, seals and packings, composite materials

**E Materials recommendations** 200

**Bibliography** 211

**Mixed Acids** 233

Author: M. B. Rockel / Editor: R. Bender

**A Metallic materials** 239

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

<b>B</b>	<b>Non-metallic inorganic materials</b>	<b>353</b>
	Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials	
<b>C</b>	<b>Organic materials/plastics</b>	<b>383</b>
	Thermoplastics, thermosetting plastics, elastomers, duroplasts	
<b>D</b>	<b>Materials with special properties</b>	<b>405</b>
	Coatings and linings, seals and packings, composite materials	
<b>E</b>	<b>Materials recommendations</b>	<b>411</b>
	<b>Bibliography</b>	<b>418</b>
	<b>Key to materials compositions</b>	<b>431</b>
	<b>Index of materials</b>	<b>447</b>
	<b>Subject index</b>	<b>459</b>

## Contents

List of Contributors VII

Preface IX

How to use the CORROSION HANDBOOK XI

Hydrochloric Acid 1

Author: A. Bäuml, P. Drodten, E. Heitz/Editor: R. Bender

A Metallic materials 12

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

B Non-metallic inorganic materials 178

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

C Organic materials/plastics 206

Thermoplastics, thermosetting plastics, elastomers, duroplasts

D Materials with special properties 239

Coatings and linings, seals and packings, composite materials

E Materials recommendations 252

Bibliography 265

**Nitric Acid 283**

Author: K. Hauffe / Editor: R. Bender

**A Metallic materials 291**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials 460**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 475**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 500**

Coatings and linings, seals and packings, composite materials

**Bibliography 510**

**Key to materials compositions 568**

**Index of materials 595**

**Subject index 613**

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Hypochlorites (bleaching solutions)** 1

Author: L. Hasenberg/Editor: R. Bender

**A Metallic materials** 13

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 92

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 106

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 126

Coatings and linings, seals and packings, composite materials

**E Materials recommendations** 128

**Bibliography** 131

**Phosphoric Acid 143**

Author: L. Hasenberg/Editor: R. Bender

**A Metallic materials 168**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials 399**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 423**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 452**

Coatings and linings, seals and packings, composite materials

**Bibliography 465**

**Key to materials compositions 487**

**Index of materials 515**

**Subject index 532**

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Drinking Water** 1

Author: G. Heim, K. Reeh/Editor: R. Bender

**A Metallic materials** 15

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 89

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 118

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 123

Coatings and linings, seals and packings, composite materials

**Bibliography** 126

**Waste Water (Municipal) 139**

Author: G. Heim, K. Reeh/Editor: R. Bender

**A Metallic materials 156**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials 172**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 205**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 211**

Coatings and linings, seals and packings, composite materials

**Bibliography 219**

**Waste Water (Industrial) 233**

Author: E. Heitz, G. Subat/Editor: R. Bender

**A Metallic materials 251**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials 283**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 308**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 335**

Coatings and linings, seals and packings, composite materials

**E Materials recommendations 355**

**Bibliography 364**

**Key to materials compositions 385**

**Index of materials 415**

**Subject index 424**



## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Carbonic Acid** 1

Author: L. Hasenberg/Editor: R. Bender

**A Metallic materials** 17

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 101

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 109

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 114

Coatings and linings, seals and packings, composite materials

**Bibliography** 117

**Chlorine Dioxide 131**

Author: L. Hasenberg/Editor: R. Bender

**A Metallic materials 148**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials 211**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 215**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 232**

Coatings and linings, seals and packings, composite materials

**E Materials recommendations 239**

**Bibliography 242**

**Seawater 257**

Author: P. Drodten/Editor: R. Bender

**A Metallic materials 333**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials 485**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 489**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 500**

Coatings and linings, seals and packings, composite materials

**E Materials recommendations 524**

**Bibliography 529**

**Key to materials compositions 569**

**Index of materials 601**

**Subject index 620**

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Atmosphere** I

Author: K. Baumann/Editor: R. Bender

**A Metallic materials** 42

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 252

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 272

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 300

Coatings and linings, seals and packings, composite materials

**Bibliography** 340

**Industrial Waste Cases 389**

Author: G. Subat/Editor: R. Bender

**A Metallic materials 410**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials 512**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 527**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 531**

Coatings and linings, seals and packings, composite materials

**E Materials recommendations 554**

**Bibliography 559**

**Key to materials compositions 575**

**Index of materials 609**

**Subject index 626**

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Sodium Chloride** 1

Authors: M. B. Rockel, D. Schedlitzki/Editor: R. Bender

**A Metallic materials** 10

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 556

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 563

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 608

Coatings and linings, seals and packings, composite materials

**E Materials recommendations** 703

**Bibliography** 716

**Key to materials compositions** 783

**Index of materials** 819

**Subject index** 839

## Contents

### Part A

#### List of Contributors VII

#### Preface IX

#### How to use the Corrosion Handbook XI

#### Chlorinated hydrocarbons – Chloromethanes 1

Authors: H. G. Spilker/Editor: R. Bender

#### A Metallic materials 25

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

#### B Non-metallic inorganic materials 154

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

#### C Organic materials/plastics 163

Thermoplastics, thermosetting plastics, elastomers, duroplasts

#### D Materials with special properties 229

Coatings and linings, seals and packings, composite materials

#### E Materials recommendations 247

#### Bibliography 293

#### Key to materials compositions 319

#### Index of materials 355

#### Subject index 375

**Part B**

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Chlorinated Hydrocarbons – Chloroethanes** 385

Author: H. G. Spilker/Editor: R. Bender

**A Metallic materials** 410

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 509

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 519

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 589

Coatings and linings, seals and packings, composite materials

**E Materials recommendations** 607

**Bibliography** 660

**Alkanols** 679

Authors: K. Hauffe/Editor: R. Bender

**A Metallic materials** 684

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials** 723

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 726

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 757

Coatings and linings, seals and packings, composite materials

**Bibliography** 761

**Key to materials compositions** 775

**Index of materials** 811

**Subject index** 831

## **Contents**

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Potassium Hydroxide** 1

Authors: P. Drodten, D. Schedlitzki/Editor: R. Bender

A Metallic materials 27

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

B Non-metallic inorganic materials 73

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

C Organic materials/plastics 82

Thermoplastics, thermosetting plastics, elastomers, duroplasts

D Materials with special properties 134

Coatings and linings, seals and packings, composite materials

E Materials recommendations 183

**Bibliography** 199



**Ammonium and Ammonium Hydroxide 1**

Authors: P. Drodten, D. Schedlitzki/Editor: R. Bender

**A Metallic materials 254**

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc cadmium and their alloys

**B Non-metallic inorganic materials 318**

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics 330**

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties 389**

Coatings and linings, seals and packings, composite materials

**E Materials recommendations 446**

**Bibliography 459**

**Key to materials compositions 493**

**Index of materials 529**

**Subject index 545**

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Sulfur Dioxide** 1

Authors: L. Hasenberg/Editor: R. Bender

**A Metallic materials** 37

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials** 254

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 264

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 287

Coatings and linings, seals and packings, composite materials

**E Materials recommendations** 294

**Bibliography** 297

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Sulfuric Acid** 1

Authors: L. Hasenberg/Editor: R. Bender

**A Metallic materials** 24

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials** 409

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 431

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 469

Coatings and linings, seals and packings, composite materials

**Bibliography** 479

**Key to materials compositions** 519

**Material index** 557

**Subject index** 570

## Contents

**List of Contributors** VII

**Preface** IX

**How to use the Corrosion Handbook** XI

**Ferrous/Ferric Chloride ( $\text{FeCl}_2$ ,  $\text{FeCl}_3$ )** 1

Authors: A. Werner/Editor: R. Bender

**A Metallic materials** 30

Aluminium and aluminium alloys, copper and copper alloys, iron, iron-based alloys and steels, nickel and nickel alloys, titanium and titanium alloys, zinc, cadmium and their alloys

**B Non-metallic inorganic materials** 359

Carbon and graphite, binders for building materials, glass, quartz ware and quartz glass, enamel, oxide ceramic materials, metal ceramic materials

**C Organic materials/plastics** 364

Thermoplastics, thermosetting plastics, elastomers, duroplasts

**D Materials with special properties** 370

Coatings and linings, seals and packings, composite materials

**Bibliography** 376

**Key to materials compositions** 395

**Material index** 433

**Subject index** 440

**Contents**

**Material index**    *1*

**Subject index**    *301*