

SpringerBriefs in Environmental Science

SpringerBriefs in Environmental Science present concise summaries of cutting-edge research and practical applications across a wide spectrum of environmental fields, with fast turnaround time to publication. Featuring compact volumes of 50 to 125 pages, the series covers a range of content from professional to academic. Monographs of new material are considered for the SpringerBriefs in Environmental Science series.

Typical topics might include: a timely report of state-of-the-art analytical techniques, a bridge between new research results, as published in journal articles and a contextual literature review, a snapshot of a hot or emerging topic, an in-depth case study or technical example, a presentation of core concepts that students must understand in order to make independent contributions, best practices or protocols to be followed, a series of short case studies/debates highlighting a specific angle.

SpringerBriefs in Environmental Science allow authors to present their ideas and readers to absorb them with minimal time investment. Both solicited and unsolicited manuscripts are considered for publication.

More information about this series at <http://www.springer.com/series/8868>

Beidou Xi · Yonghai Jiang
Mingxiao Li · Yu Yang · Caihong Huang

Optimization of Solid Waste Conversion Process and Risk Control of Groundwater Pollution

Beidou Xi
Chinese Research Academy
of Environmental Sciences
Beijing
China

Yu Yang
Chinese Research Academy
of Environmental Sciences
Beijing
China

Yonghai Jiang
Chinese Research Academy
of Environmental Sciences
Beijing
China

Caihong Huang
Chinese Research Academy
of Environmental Sciences
Beijing
China

Mingxiao Li
Chinese Research Academy
of Environmental Sciences
Beijing
China

ISSN 2191-5547 ISSN 2191-5555 (electronic)
SpringerBriefs in Environmental Science
ISBN 978-3-662-49460-8 ISBN 978-3-662-49462-2 (eBook)
DOI 10.1007/978-3-662-49462-2

Library of Congress Control Number: 2016932350

© The Author(s) 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This Springer imprint is published by SpringerNature
The registered company is Springer-Verlag GmbH Berlin Heidelberg

Contents

1	Introduction	1
2	Solid Waste Conversion and Dynamic Multi-objective Optimization	3
2.1	Overview	3
2.2	Law of Solid Waste Conversion and the Environmental Effects	4
2.2.1	Humification of Organic Waste	4
2.2.2	Anaerobic Digestion of Organic Waste	10
2.2.3	Solid Waste Landfill	15
2.3	Technical Methods for Dynamic Multi-objective Optimization of Solid Waste Management	20
2.3.1	Construction of the Model for Dynamic Multi-objective Optimization Under Uncertainty	21
2.3.2	Model for Dynamic Multi-objective Optimization Under Uncertainty	23
	References	31
3	Classified Resourcization of Solid Waste and Process-Wide Control of Secondary Pollution	33
3.1	Overview	33
3.2	Technologies for Classified Solid Waste Collection and Transportation, Biological Pretreatment, and Mechanical Sorting	34
3.2.1	Precompression	34
3.2.2	Biological Pretreatment and Mechanical Sorting	35
3.3	Technologies for Classified Utilization of Solid Waste	38
3.3.1	Biofortification Composting	38
3.3.2	Efficient Anaerobic Digestion	39
3.3.3	Pyrolysis and Gasification	41

3.4	Technologies for the Control of Secondary Pollution	42
3.4.1	In Situ Reduction of Landfill Leachate	42
3.4.2	Malodorous Gas Generation and Treatment.	44
3.4.3	Biogas Residue Production and Resourcization	46
3.5	Technologies for Integrated Solid Waste Treatment and Management System Optimization	46
	References	50
4	Solid Waste Disposal and Synergetic Pollution Control	53
4.1	Bioreactor Landfill and Synergetic Pollution Control	53
4.1.1	Organic Matter Reduction Dynamics and Stabilization Technologies	54
4.1.2	Nitrogen Conversion Process and In Situ Removal Optimization Mechanism	59
4.1.3	Interaction of Pollutants in the Leachate and Discontinuous Permeable Reactive Barrier (PRB)	59
4.1.4	Engineering Applications for Rapid Stabilization of Bioreactor Landfill and Collaborative Control of Secondary Pollution	61
4.2	Hazardous Waste Treatment and Synergetic Cement Kiln Treatment	62
4.2.1	Treatment and Disposal of Typical Hazardous Waste	62
4.2.2	Synergetic Hazardous Waste Treatment in Cement Kiln	72
	References	73
5	Groundwater Pollution and Its Risk in Solid Waste Disposal Site	75
5.1	Groundwater Pollution in Solid Waste Disposal Site	75
5.1.1	Household Waste Landfill Site	75
5.1.2	Hazardous Waste Landfill Site	79
5.2	Survey of the Groundwater Pollution in Solid Waste Disposal Site	86
5.2.1	Survey Content and Procedures	86
5.2.2	Layout of Groundwater Monitoring Wells and Sampling	89
5.3	Optimization and Application of 3MRA Model	99
5.3.1	Introduction of the Model System	99
5.3.2	Risk Assessment of Groundwater in China's Landfill Areas Based on the 3MRA Model	99
	References	104
6	Ranking Management Technology System for Groundwater Pollution Risk of Landfill	105
6.1	Index System for Groundwater Pollution Risk Ranking of Landfill	105

- 6.1.1 Establishment Principles for Index System 105
- 6.1.2 Methods and Procedures for Construction of Index System. 106
- 6.1.3 Construction of Index System 107
- 6.1.4 Index Weight Assignment 107
- 6.2 Technical Methods for Groundwater Pollution Risk Ranking of Landfill 110
 - 6.2.1 Risk Ranking Methods. 110
 - 6.2.2 Case Analysis 111
- 6.3 Ranking Management of Groundwater Contamination in Landfill. 117
 - 6.3.1 Connotation of Risk Ranking Management. 117
 - 6.3.2 Procedures and Methods of Ranking Management. 118
- References 122
- Index 123**