

Godfrey A. Uzochukwu · Keith Schimmel
Vinayak Kabadi · Shoou-Yuh Chang
Tanya Pinder · Salam A. Ibrahim

Proceedings of the 2013
National Conference
on Advances in
Environmental Science
and Technology

Proceedings of the 2013 National Conference
on Advances in Environmental Science
and Technology

Godfrey A. Uzochukwu • Keith Schimmel
Vinayak Kabadi • Shoou-Yuh Chang
Tanya Pinder • Salam A. Ibrahim
Editors

Proceedings of the 2013
National Conference
on Advances in
Environmental Science
and Technology

 Springer

Editors

Godfrey A. Uzochukwu
North Carolina A&T State University
Greensboro, NC, USA

Keith Schimmel
North Carolina A&T State University
Greensboro, NC, USA

Vinayak Kabadi
North Carolina A&T State University
Greensboro, NC, USA

Shoou-Yuh Chang
North Carolina A&T State University
Greensboro, NC, USA

Tanya Pinder
North Carolina A&T State University
Greensboro, NC, USA

Salam A. Ibrahim
North Carolina A&T State University
Greensboro, NC, USA

ISBN 978-3-319-19922-1

ISBN 978-3-319-19923-8 (eBook)

DOI 10.1007/978-3-319-19923-8

Library of Congress Control Number: 2015946565

Springer Cham Heidelberg New York Dordrecht London

© Springer International Publishing Switzerland 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

Springer International Publishing AG Switzerland is part of Springer Science+Business Media (www.springer.com)

Preface

This book contains peer-reviewed chapters accepted for presentation at the National Conference on Advances in Environmental Science and Technology. The chapters are arranged by topics with names of authors and affiliations.

Several conversations about environmental regulations, groundwater remediation technologies and waste to energy, climate change, economics and environmental justice, fate and transport of contaminants, food bio-processing, innovative environmental technologies, sustainable energy and water resources and waste management among federal agencies, private agencies, and university professors set the stage for the September 12, 2013 National Conference on Advances in Environmental Science and Technology. The purpose of the National Conference on Advances in Environmental Science and Technology which was held in Greensboro, North Carolina, was to provide a forum for agencies to address advances in environmental science and technology including problems, solutions, and research needs. Our goal was to foster relationships that could result in partnerships needed to protect, sustain the environment and improve the quality of life.

The National Conference on Advances in Environmental Science and Technology was sponsored by Sullivan International Group, Waste Industries, CDM Smith, United States Department of Energy, United States Environmental Protection Agency, National Aeronautics and Space Administration, National Science Foundation, and North Carolina Agricultural and Technical State University. These agencies are thanked for their financial and logistics support. The hard work of Tarcy Keyes, Stephen Johnson, Angela Smith, and Pat O'Connor is gratefully acknowledged. Special thanks to Johnseely S. Cyrus, Stephanie Luster Teasley, and Heather Stewart for their assistance. The following keynote speakers are thanked for their contributions: Michael Maloy, Vice President, Sullivan International Group, San Diego; Greg Green, Director of Outreach and Information, United States Environmental Protection Agency; Barry Edwards, Director of Utilities and Engineering, Catawba County Government, NC; Joe B. Whitehead, Jr., Provost and Vice Chancellor for Academic Affairs at North Carolina Agricultural

and Technical State University; and Barry Burks, Vice Chancellor for Research and Economic Development at North Carolina Agricultural and Technical State University.

Greensboro, NC

Godfrey A. Uzochukwu
Vinayak Kabadi
Shoou Yuh Chang
Keith Schimmel
Tanya Pinder
Salam A. Ibrahim

Contents

Part I Climate Change

Assessment of Climate Change Impact on Watershed Hydrology	3
Somsubhra Chattopadhyay and Manoj K. Jha	
Trend of Climate Variability in North Carolina During the Past Decades	13
Mohammad Sayemuzzaman and Manoj K. Jha	
Arctic Storm and Its Impact on the Surface Winds over the Chukchi-Beaufort Seas	21
Wei Tao, Jing Zhang, Xiangdong Zhang, and Junming Chen	
Designing a Remote In Situ Soil Moisture Sensor Network for Small Satellite Data Retrieval	35
Rawfin Zaman, William W. Edmonson, and Manoj K. Jha	
Alaskan Regional Climate Changes in Dynamically Downscaled CMIP5 Simulations	47
Jing Zhang, Jeremy Krieger, Uma Bhatt, Chuhan Lu, and Xiangdong Zhang	

Part II Fate and Transport of Contaminants

Application of Kalman Filter Embedded with Neural Network in 3-Dimensional Subsurface Contaminant Transport Modeling	63
Godwin Appiah Assumaning and Shoou-Yuh Chang	
Application of Adaptive Extended Kalman Filtering Scheme to Improve the Efficiency of a Groundwater Contaminant Transport Model	75
Shoou-Yuh Chang and Elvis B. Addai	

Application of Ensemble Square Root Kalman Filter in a Three-Dimensional Subsurface Contaminant Transport Model	87
Shoou-Yuh Chang and Torupallab Ghoshal	
Application of 3D VAR Kalman Filter in a Three-Dimensional Subsurface Contaminant Transport Model for a Continuous Pollutant Source	97
Shoou-Yuh Chang and Anup Saha	
Groundwater Flow Modeling in the Shallow Aquifer of Buffalo Creek, Greensboro	105
Jenberu Feyyisa, Manoj K. Jha, and Shoou-Yuh Chang	
Part III Food Bioprocessing	
Inactivation of <i>E. coli</i> O157:H7 on Rocket Leaves by Eucalyptus and Wild-Thyme Essential Oils	119
Saddam S. Awaisheh	
Decontamination of <i>Escherichia coli</i> O157:H7 from Leafy Green Vegetables Using Ascorbic Acid and Copper Alone or in Combination with Organic Acids	131
Rabin Gyawali and Salam A. Ibrahim	
Enzymatic Activity of <i>Lactobacillus</i> Grown in a Sweet Potato Base Medium	137
Saeed A. Hayek and Salam A. Ibrahim	
Effect of Metal Ions on the Enzymatic Activity of <i>Lactobacillus reuteri</i> Growing in a Sweet Potato Medium	145
Saeed A. Hayek and Salam A. Ibrahim	
Using Sweet Potatoes as a Basic Component to Develop a Medium for the Cultivation of Lactobacilli	157
Saeed A. Hayek, Abolghasem Shahbazi, and Salam A. Ibrahim	
Impact of Gums on the Growth of Probiotic Microorganisms	165
Bernice D. Karlton-Senaye and Salam A. Ibrahim	
Interaction Between <i>Bifidobacterium</i> and Medical Drugs	171
Temitayo O. Obanla, Saeed A. Hayek, Rabin Gyawali, and Salam A. Ibrahim	
Functional Food Product Development from Fish Processing By-products Using Isoelectric Solubilization/Precipitation	179
Reza Tahergorabi and Salam Ibrahim	

Part IV Sustainable Energy

Optimizing the Design of Chilled Water Plants in Large Commercial Buildings 187
 Dante’ Freeland, Christopher Hall, and Nabil Nassif

Optimizing Ice Thermal Storage to Reduce Energy Cost 195
 Christopher L. Hall, Dante’ Freeland, and Nabil Nassif

Optimization of HVAC Systems Using Genetic Algorithm 203
 Tony Nguyen and Nabil Nassif

Artificial Intelligent Approaches for Modeling and Optimizing HVAC Systems 211
 Raymond Tesiero, Nabil Nassif, and Harmohindar Singh

Part V Waste Management

Experimental Study of MSW Pyrolysis in Fixed Bed Reactor 223
 Emmanuel Ansah, John Eshun, Lijun Wang, Abolghasem Shahbazi, and Guidgopuram B. Reddy

Separate Hydrolysis and Fermentation of Untreated and Pretreated Alfalfa Cake to Produce Ethanol 233
 Shuangning Xiu, Nana Abayie Boakye-Boaten, and Abolghasem Shahbazi

Tax Policy’s Role in Promoting Sustainability 241
 Gwendolyn McFadden and Jean Wells

Scrap Tires Air Emissions in North Carolina 249
 Vereda Johnson Williams and Godfrey A. Uzochukwu

Index 259

Contributors

Elvis B. Addai Department of Civil Engineering, North Carolina Agricultural & Technical State University, Greensboro, NC, USA

Emmanuel Ansah Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Godwin Appiah Assumaning Department of Civil and Environmental Engineering, NC A&T State University, Greensboro, NC, USA

Saddam S. Awaisheh Department of Nutrition and Food Processing, Al-Balqa Applied University, Salt, Jordan

Uma Bhatt Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK, USA

Nana Abayie Boakye-Boaten Department of Natural Resources and Environmental Design, North Carolina A and T State University, Greensboro, NC, USA

Shoo-u Yuh Chang Department of Civil, Architectural, and Environmental Engineering, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Somsubhra Chattopadhyay Department of Computational Science and Engineering and Civil, Architectural and Environmental Engineering, North Carolina A&T State University, Greensboro, NC, USA

Junming Chen International Arctic Research Center, University of Alaska Fairbanks, Fairbanks, AK, USA

William W. Edmonson Department of Electrical and Computer Engineering, North Carolina A&T State University, Greensboro, NC, USA

John Eshun Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Jenberu Feyyisa Department of Civil, Architectural, and Environmental Engineering, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Dante' Freeland Department of CAAE Engineering, North Carolina A&T State University, Greensboro, NC, USA

Torupallab Ghoshal Department of Civil Engineering, North Carolina A&T State University, Greensboro, NC, USA

Rabin Gyawali Department of Energy and Environmental Systems, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Christopher L. Hall Department of Civil and Architectural Engineering, North Carolina A&T State University, Greensboro, NC, USA

Saeed A. Hayek Department of Energy and Environmental Systems, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Regine Hock Geophysical Institute, University of Alaska Fairbanks, Fairbanks, AK, USA

Salam A. Ibrahim Department of Family and Consumer Sciences, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Manoj K. Jha Department of Civil, Architectural and Environmental Engineering, North Carolina A&T State University, Greensboro, NC, USA

Bernice D. Karlton-Senaye North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Jeremy Krieger Arctic Region Supercomputing Center, University of Alaska Fairbanks, Fairbanks, AK, USA

Chuhan Lu International Arctic Research Center, University of Alaska Fairbanks, Fairbanks, AK, USA

Gwendolyn McFadden North Carolina A&T State University, Greensboro, NC, USA

Nabil Nassif Department of Civil and Architectural Engineering, North Carolina A&T State University, Greensboro, NC, USA

Tony Nguyen Department of Civil, Architectural and Environmental Engineering, North Carolina A&T State University, Greensboro, NC, USA

Temitayo O. Obanla North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Guidopuram B. Reddy Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Anup Saha Department of Civil Engineering, North Carolina A&T State University, Greensboro, NC, USA

Mohammad Sayemuzzaman Department of Energy and Environmental System, North Carolina A&T State University, Greensboro, NC, USA

Abolghasem Shabbazi Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Harmohindar Singh Department of Civil and Architectural Engineering, North Carolina A&T State University, Greensboro, NC, USA

Reza Tahergorabi North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Wei Tao Department of Physics and EES, North Carolina A&T State University, Greensboro, NC, USA

Raymond Tesiero Department of Computational Science and Engineering, North Carolina A&T State University, Greensboro, NC, USA

Godfrey A. Uzochukwu Waste Management Institute, North Carolina A&T State University, Greensboro, NC, USA

Lijun Wang Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University, Greensboro, NC, USA

Jean Wells Howard University, Washington, DC, USA

Vereda Johnson Williams North Carolina A&T State University, Greensboro, NC, USA

Shuangning Xiu Department of Natural Resources and Environmental Design, North Carolina A and T State University, Greensboro, NC, USA

Rawfin Zaman Department of Electrical and Computer Engineering, North Carolina A&T State University, Greensboro, NC, USA

Jing Zhang Department of Physics, North Carolina A&T State University, Greensboro, NC, USA

Department of Energy and Environmental Systems, North Carolina A&T State University, Greensboro, NC, USA

Xiangdong Zhang International Arctic Research Center, University of Alaska Fairbanks, Fairbanks, AK, USA

Part I

Climate Change