State of the Science of Chlorine Dioxide in Drinking Water
[Project #3150]

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PRINCIPAL INVESTIGATORS:
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OBJECTIVES:
The objectives of this project were to produce a current reference book with a somewhat integrated "global" view of the use of chlorine dioxide, encompassing scientific, technological, and operational approaches used in drinking water treatment in developed nations; to compare and contrast European and North American practices and their experiences with chlorine dioxide production, applications, and regulations; and to update knowledge about the current technologies of production, process control, and residual monitoring in plants and distribution systems.

BACKGROUND:
The international drinking water community has more than 60 years of experience with chlorine dioxide. There is a wealth of practical information available from water utilities, consultants, regulators, and other professionals regarding the effective use of chlorine dioxide in water treatment. Knowledge gaps and unresolved issues related to chlorine dioxide usage have also been recognized. However, much of this information exists in various publications including published papers, conference proceedings, and utility case studies. There is a need for a reference book that will pull together the current scientific knowledge on chlorine dioxide and its applications in drinking water treatment.

HIGHLIGHTS:
This book provides a new and up-to-date, reliable reference source for a more global context of chlorine dioxide technology. It addresses updated practical approaches from a wide variety of source materials on chlorine dioxide without being excessively theoretical. The intention of the authors and scientific editors is to offer to a rather broad audience the most current scientific information about chlorine dioxide, along with operational practices, analytical expertise, and utility experiences through case histories as well as the expertise of individual authors.

APPROACH:
In 2004, the Water Research Foundation (formerly Water Research Foundation) and the Italian-based Fondazione AMGA recognized the need for a research project to critically update information on the science of chlorine dioxide for use in drinking water. This project began with an organizational meeting held at Water Research Foundation headquarters in Denver, Colorado, in the spring of 2005, followed by a meeting of more than two dozen selected authors from both Europe and North America in Genoa (Italy) in early 2006 to discuss the scope, target audiences, organizational chapters, and scientific content of the book. Both European and North American experts were involved with each chapter to maximize the cross-fertilization of their respective chlorine dioxide experience, and this is reflected throughout the organization of each chapter. Each chapter was reviewed by the book editors several times.
RESULTS/FINDINGS:
The book addresses updated practical approaches from a wide variety of source materials on chlorine
dioxide. The intention of the authors and scientific editors is to offer to a rather broad audience the most
current scientific information about chlorine dioxide, along with operational practices, analytical expertise,
and utility experiences through case histories as well as the expertise of individual authors. The book has
nine chapters, which are listed below:

Chapter 1: Introductory Background and Legislative/Regulatory Perspectives
Chapter 2: Chlorine Dioxide Chemistry, Reactions, and Disinfection By-Products
Chapter 3: Generation Technologies and Chemical Safety
Chapter 4: Application Strategies in Drinking Water
Chapter 5: Inactivation of Microorganisms by Chlorine Dioxide
Chapter 6: Distribution Systems
Chapter 7: The Measurement of Residuals and Monitoring Strategies
Chapter 8: Drinking Water Treatment with Chlorine Dioxide and Potential Health Effects
Chapter 9: Conclusions and Future Research Needs

Each chapter discusses the issue in-depth and concludes with a list of research ideas related to the chapter
topic.

IMPACT:
Unlike previous research projects or user manuals on chlorine dioxide, this book takes an integrated, global
view. It attempts to bridge the enormous gap that exists between North American and European approaches to
chlorine dioxide application and regulation. Differences in generation technologies, monitoring requirements,
and novel approaches to improved surveillance in public water systems are discussed. Interested parties will
be able to find reliable, current material on chlorine dioxide and its related chemistry in this single professional
source.

RESEARCH PARTNER:
Fondazione AMGA