

CONTENTS

SECTION I. CHEMISTRY OF FRESHWATER SYSTEMS

	Soluble Organic Constituents of Natural Waters and Wastewaters Before and After Chlorination, <i>William H. Glaze and Gary R. Peyton</i>	3
2.	Natural and Model Aquatic Humics: Reactions with Chlorine <i>R. F. Christman, J. D. Johnson, J. R. Hass, F. K. Pfaender, W. T. Liao, D. L. Norwood and H. J. Alexander</i>	15
3.	Precursors and Mechanisms of Haloform Formation in the Chlorination of Water Supplies, <i>J. Carrell Morris and Barbara Baum</i>	29
4.	Reactions of Chlorine, Chlorine Dioxide and Mixtures Thereof with Humic Acid: An Interim Report, <i>Manfred G. Noack and Richard L. Doerr</i>	49
5.	Aqueous Chlorination Products of Polynuclear Aromatic Hydrocarbons, <i>R. M. Carlson, R. Caple, A. R. Oyler, K. J. Welch, D. L. Bodenner and R. Liukkonen</i>	59
6.	Aqueous Chlorination of Some Phenolic Acids, <i>Arlene L. Rockwell and Richard A. Larson</i>	67

SECTION II. ENVIRONMENTAL EFFECTS IN FRESHWATER SYSTEMS

7.	A Program to Introduce Site-Specific Chlorination Regimes at Ontario Hydro Generating Stations, <i>J. A. Grieve, L. E. Johnston, T. G. Dunstall and J. Minor</i>	77
8.	A Preliminary Look at the Effects of Intermittent Chlorination on Selected Warmwater Fishes, <i>Arthur S. Brooks and Gregory L. Seegert</i>	95
9.	Toward an Understanding of the Toxicity of Intermittent Exposures of Total Residual Chlorine to Freshwater Fishes <i>Gary L. Larson and David A. Schlesinger</i>	1
10.	Influence of Chlorine Form and Ambient Temperature on the Toxicity of Intermittent Chlorination to Freshwater Fish <i>Alan G. Heath</i>	123

11	The Use of Various Avoidance Indices to Evaluate the Behavioral Response of the Golden Shiner to Components of Total Residual Chlorine, <i>Stephan R. Larrick, Donald S. Cherry, Kenneth L. Dickson and John Cairns, Jr.</i>	135
12.	Avoidance of Monochloramine: Test Tank Results for Rainbow Trout, Coho Salmon, Alewife, Yellow Perch and Spottail Shiner <i>Raymond B. Bogardus, Terry C. Teppen, David B. Boies and Frank J. Horvath.</i>	149
13.	Investigation of the Effects of Halogenated Organic Compounds Produced in Cooling Systems and Process Effluents on Aquatic Organisms, <i>J. R. Trabalka and M. B. Burch.</i>	163
14.	Brominated Compounds Found in Waste-Treatment Effluents and Their Capacity to Bioaccumulate, <i>Douglas W. Kuehl, Gilman D. Veith and Edward N. Leonard.</i>	175

**SECTION III.
CHEMISTRY OF MARINE SYSTEMS**

15	Reactions in Chlorinated Sea Water, <i>James H. Carpenter and Carroll A. Smith</i>	195
16.	Chlorine Degradation and Halocarbon Production in Estuarine Waters, <i>George R. Helz, Richard Sugam and Rong Y. Hsu.</i>	209
17	Investigation of Halogenated Components Formed From Chlorination of Marine Water, <i>Roger M. Bean, Robert G. Riley and Phillip W. Ryan</i>	223
18.	The Effect of Ammonia Concentration on the Chemistry of Chlorinated Sea Water, <i>Guy W. Inman, Jr. and J. Donald Johnson</i>	235
19.	Microbial Degradation of Halogenated Hydrocarbons <i>Al W. Bourquin and David T. Gibson</i>	253

**SECTION IV.
ENVIRONMENTAL EFFECTS IN MARINE SYSTEMS**

20.	DDT, PCB and Chlorinated Benzenes in the Marine Ecosystem Off Southern California, <i>David R. Young and Theodore C. Heesen</i>	267
21.	Biological and Chemical Effects of Chlorination at Coastal Power Plants, <i>Joel C. Goldman, Judith M. Capuzzo and George T. F. Wong</i>	291
22.	Toxicity Screening of Fifteen Chlorinated and Brominated Compounds Using Four Species of Marine Phytoplankton <i>Stanton J. Erickson and Anne J. Freeman</i>	307

23.	Seasonal Chronic Toxicity of Chlorination to the American Oyster, <i>Crassostrea virginica</i> (G), <i>Geoffrey I. Scott and Douglas P. Middaugh</i>	311
24.	Effects of Chlorinated Sea Water on Decapod Crustaceans <i>Morris H. Roberts, Jr.</i>	329
25.	The Relative Sensitivity of Pacific Northwest Fishes and Invertebrates to Chlorinated Sea Water, <i>T. O. Thatcher</i>	341
26.	Respiratory and Osmoregulatory Responses of White Perch (<i>Morone americana</i>) Exposed to Chlorine and Ozone in Estuarine Waters, <i>Ronald M. Block, Dennis T. Burton, Steven R. Gullans and Leonard B. Richardson</i>	351
27.	Continuous Low-Level Chlorination for Marine Fouling Control at Power Stations in the United Kingdom, <i>John W. Whitehouse</i>	361
28.	Response of Entrained Plankton to Low-Level Chlorination at a Coastal Power Station, <i>M. H. Davis and J. Coughlan</i>	369

**SECTION V.
HEALTH EFFECTS**

29.	The Epidemiologic Approach to the Evaluation of Organics in Drinking Water, <i>Kenneth P. Cantor and Leland J. McCabe</i>	379
30.	A Case Control Study of Gastrointestinal and Urinary Tract Cancer Mortality and Drinking Water Chlorination, <i>Michael Alavanja, Inge Goldstein and Mervyn Susser</i>	395
31.	Mutagenicity and Water Chlorination: Prospect and Perspective <i>Robert B. Cumming</i>	411
32.	The Mutagenic Activity of Halogenated Compounds Found in Chlorinated Drinking Water, <i>Vincent F. Simmon and Robert G. Tardiff</i>	417
33.	Mutagenicity of Complex Mixtures from Drinking Water <i>John C. Loper, Dennis R. Lang and Carl C. Smith</i>	433
34.	A Priori Predictive Methods of Assessing Health Effects of Chemicals in the Environment, <i>Mathilde J. Kland</i>	451
35.	Development of Resistant Poliovirus by Repetitive Sublethal Exposure to Chlorine, <i>Robert C. Bates, Peter T. B. Shaffer and Susan M. Sutherland</i>	471
36.	Epidemic Problems and Chlorination of Drinking Water and Sewage in the Federal Republic of Germany, <i>Gertrud Müller</i>	483

37.	Worldwide Aspects of Water Chlorination, <i>L. A. Orihuela, R. C. Ballance and R. Novick</i>	493
38.	Risk Assessment of the Health Effects of Water Chlorination <i>Marvin Schneiderman</i>	509

SECTION VI.

DRINKING WATER TREATMENT: TRIHALOMETHANE FORMATION AND REDUCTION, AND ALTERNATIVES TO CHLORINATION

39.	Chlorination and Water Treatment for Minimizing Trihalomethanes in Drinking Water, <i>Robert C. Hoehn, Robert P. Goode, Clifford W. Randall and Peter T. B. Shaffer</i>	519
40.	Formation and Occurrence of Haloforms in Drinking Water in the Federal Republic of Germany, <i>M. Sonneborn and B. Bohn</i> . . .	537
41.	Optimizing Trihalomethane Analysis, <i>Albert R. Trussell, Mark D. Umphres, Lawrence Y. C. Leong and R. Rhodes Trussell</i>	543
42.	Ozone, Chlorine Dioxide and Chloramines as Alternatives to Chlorine for Disinfection of Drinking Water, <i>James M. Symons, J. Keith Carswell, Robert M. Clark, Paul Dorsey, Edwin E. Geldreich, W. Paul Heffernan, John C. Hoff, O. Thomas Love, Jr., Leland J. McCabe and Alan A. Stevens</i>	555
43.	Evaluation of the Capability of Granular Activated Carbon and Resins to Remove Chlorinated and Other Trace Organics From Treated Drinking Water, <i>I. H. Suffet, J. V. Radziul, P. R. Cairo and J. T. Coyle</i>	561
44.	Trihalomethane Formation From Iodine and Chlorine Disinfection of Ohio River Water, <i>Janet A. Rickabaugh and Riley N. Kinman</i>	583
45.	The Effect of Preozonation on Chloroform Production in the Chlorine Disinfection Process, <i>Tim L. Riley, Khalil H. Mancy and Edward A. Boettner</i>	593
46.	Trihalomethane Reduction at the Louisville Water Company <i>S. A. Hubbs, J. S. Zogorski, D. A. Wilding, A. N. Arbuckle, G. D. Allgeier and R. L. Mullins</i>	605

SECTION VII.

WASTEWATER TREATMENT AND ALTERNATIVES TO CHLORINATION

47.	Generation of Volatile Organic Compounds from Nonvolatile Precursors in Water by Treatment with Chlorine or Ozone
-----	---

	<i>Robert E. Sievers, Robert M. Barkley, Gary A. Eiceman, Larry P. Haack, Robert H. Shapiro and Harold F. Walton</i>	615
48.	A Study of Alternatives to Chlorination for Disinfection of Wastewater, <i>Albert D. Venosa and Ronald W. Ward</i>	625
49.	Bromine Chloride as an Alternative Wastewater Disinfectant to Chlorine, <i>William L. Woodfin, Jr., Robert B. Taylor and Robert C. Hoehn</i>	629
50.	A Comparison of Bromine Chloride and Chlorine as Wastewater Disinfectants in Pilot Plant Studies, <i>Norman E. LeBlanc and J. Michael McEuen</i>	
51.	Chlorine Dioxide Destruction of Viruses and Bacteria in Water <i>S. Cronier, P. V. Scarpino and M. L. Zink</i>	651
52.	Chlorine and Activated Carbon Treatment for Removal of Toxic Substances from Water, <i>R. G. Howland and C. J. Wallace</i>	659
53.	Ultraviolet Disinfection of Municipal Effluents, <i>Albert D. Venosa, Harold W. Wolf and Albert C. Petrasek</i>	

**SECTION VIII.
COOLING WATER TREATMENT AND ALTERNATIVES
TO CHLORINATION**

54.	Chlorine Application for the Control of Condenser Fouling <i>D. Heyward Hamilton, Jr.</i>	
55.	An Experimental Assessment of Halogenated Organics in Waters from Cooling Towers and Once-Through Systems, <i>Robert L. Jolley, W. Wilson Pitt, Jr., Fred G. Taylor, Jr., Steve J. Hartmann, Guy Jones, Jr. and James E. Thompson</i>	
56.	A Kinetic Model for Predicting the Composition of Chlorinated Water Discharged from Power Plant Cooling Systems, <i>Milton H. Lietzke</i>	707
57.	Biofouling Control Alternatives to Chlorine for Power Plant Cooling Water Systems: An Overview, <i>Dennis T. Burton and Lawrence H. Liden</i>	717
58.	Bromine Chloride—An Alternative Biofouling Control Agent for Cooling Water Treatment, <i>Leonard H. Bongers, Dennis T. Burton, Lawrence H. Liden and Thomas P. O'Connor</i>	735
59.	Evaluation of Alternative Chemical Treatments for Biofouling Control in Electric Power Facilities, <i>Thomas D. Waite, Roger M. Jorden and Robert Kawaratani</i>	753

**SECTION IX.
INDUSTRIAL EFFLUENTS**

60.	Chlorination Practices in the Textile Industry, <i>Wayne Coleman Tinch</i>	775
61	Chlorination Effects on Typical Organic Chemical Plant Effluents <i>Jurgen H. Exner, Robert D. Fox, Charles S. Parmele and John R. Moyer</i>	791
62	Chlorination Practices in the Iron and Steel Industry <i>Norman Plaks and Edward G. Fochtman</i>	

**SECTION X.
REGULATIONS**

63.	Regulatory Aspects of Potable Water Disinfection, <i>Joseph A. Cotruvo</i>	
64.	Status of Regulation Development for Cooling Water Discharges From Power Plants, <i>John Lum</i>	823
65.	Municipal Wastewater Disinfection Policy, <i>Alan Hais</i>	831
66.	Status of Sewage Effluent Disinfection Investigations in Ontario <i>Jack D. Ellis</i>	

**SECTION XI.
WORKSHOPS AND CONFERENCE SUMMARIES:
PROGRESS, PROBLEMS AND FUTURE PRIORITIES**

67.	Freshwater Workshop Summary, <i>Jack S. Mattice and William A. Brungs</i>	851
68.	Marine Workshop Summary, <i>William P. Davis and William F. McIlhenny</i>	859
69.	Health Effects Workshop Summary, <i>Robert B. Cumming and Hend Gorchev</i>	863
70.	Trihalomethanes Workshop Summary, <i>Donald J. MacGregor and George C. Becking</i>	867
71.	Alternatives Workshop Summary, <i>George C. Becking and Donald J. MacGregor</i>	871
72.	Industrial Effluents Workshop Summary, <i>W. Wilson Pitt, Jr.</i>	877
73.	Conference Summary, <i>J. Carrell Morris</i>	879
74.	Conference Adjournment: Closing Remarks, <i>Hend Gorchev</i>	887
	INDEX	891