

## **HENRY A. BOYTER, PH.D.**

### **EDUCATION**

Ph.D., Chemistry, University of Virginia, 1987

M.S., Chemistry, University of Virginia, 1984

B.S., Chemistry, Clemson University, 1978

OSHA Train the Trainer, A.H. Reppert, 2003

Advanced EMS Auditors Course For Quality and Environmental Professionals, QSD, 2002

Environmental Management Systems Lead Auditors Course, QSD, 2002

Lead Inspector/Risk Assessor 8-Hour Refresher Course (USEPA, Virginia), ODES, 2006, 2008

Lead Inspector/Risk Assessor 8-Hour Refresher Course (USEPA, Virginia), A.H. Reppert, 2002

Lead Inspector/Risk Assessor 8-Hour Refresher Course (Virginia), ITC, 1999

Lead Inspector/Risk Assessor 40-Hour Course (Virginia), ITC 1996

Inspecting Buildings For ACM Refresher 4-Hour Course (USEPA), ODES 2004-2010

Inspecting Buildings For ACM Refresher 4-Hour Course (USEPA), A.H. Reppert 2001-2003

Inspecting Buildings For ACM Refresher 4-Hour Course (USEPA), ITC 1992-2000

Inspecting Buildings For ACM 24-Hour Course (USEPA), ITC 1991

Sampling and Evaluating Airborne Asbestos Dust - NIOSH 582, Havens Laboratories, 1991

OSHA 40-Hour 1910.120 HAZWOPPER, Havens Laboratories, 1991

Bulk Asbestos Fiber Analysis and Identification, Havens Laboratories, 1988

### **PROFESSIONAL SUMMARY**

Director of Research - Institute of Textile Technology, Raleigh, NC, 2004-present

Provides oversight of the Institute's Technical Advisory Committee (TAC) Process and Research Budget. This Committee process funds applied research projects conducted by university, private, and Institute principal investigators through a competitive proposal process. The 2006-2007 total research budget will exceed \$600,000. The TAC is governed by the Institute's members and is driven by the TAC Research Subcommittees: Functional Fabrics, Yarn and Fabric Formation, Economic Competitiveness, and CESTAB (Committee for Economically Sustainable Textile and Apparel Businesses). This process also supplies the research funds for the Institute Graduate Fellows at North Carolina State University.

## **PROFESSIONAL SUMMARY (continued)**

### CESTAB Director - Institute of Textile Technology, Raleigh, NC, 2007-present

Provides oversight of the Institute's Committee for Economically Sustainable Textile and Apparel Businesses. This Institute subcommittee has a twofold purpose within the Institute.

1. To promote research through our Technical Advisory Committee process and to work with ITT Fellows on research projects in this area of study.
2. To educate Textile and Apparel Businesses in real world Sustainability and to work with other industry groups to promote Sustainability that is rooted in science and economics.

This subcommittee uses several forms of communication to work with Institute Members and the general textile industry.

1. Technical Advisory Committee and Subcommittee functions
2. Membership and participation in industry groups and standard development groups
3. Website pages for sustainability information.
4. Members only sustainability blog to inform Institute members of new information and breaking news.
5. General sustainability news blog to educate the public on sustainability issues.
6. Workshops for Institute members and the general public on sustainability.

### Director of Environmental Services - AT&E, Earlysville, Virginia 1998-present

Supervises all environmental management services. Services are provided and experience covers more than 15 years and encompasses Environmental, Health, Safety, and Risk Assessments, Asbestos Services, Sick Building and Indoor Air Quality Evaluations, Phase I and II Surveys, and Remediation and Phase III Surveys for numerous Private Sector, Schools, State, Federal, Industrial and Business Clients. Studies are used to identify current environmental concerns and how these concerns can be eliminated through treatment options, pollution prevention, chemical substitution, or process changes. The methods used in this research include Toxicity Reduction Evaluations, Facility Information Technologies, Product Modification Research, Chemical and Biological Treatability Studies, Toxicity Identification Evaluations, and Raw Material Assessments. Supervises fundamental environmental research to study current environmental problems including water quality testing, water quality methods, waste minimization, toxicity characterization, and wastewater treatability. Environmental research has been conducted for the Alabama Textile Manufacturer's Association (ATMA), the American Manufacturer's Institute (ATMI), USEPA, and clients in the paper, textile, refrigeration, and food processing industries.

## **PROFESSIONAL SUMMARY (continued)**

Adjunct Assistant Professor (2003-present) North Carolina State University College of Textiles

Research Fellow and Director of Analytical Services - Institute of Textile Technology, Raleigh, NC, 2003-present

Director of EHS Services - Institute of Textile Technology, Raleigh, NC, 2003-present

Chair of AATCC RA100 Safety, Health and Environmental Technology Committee, 2005-2007

Senior Scientist / Director of Lab Services - Earth Tech, Charlottesville, Virginia 1993-1998

Supervised fundamental environmental research to study current environmental problems including water quality testing, water quality methods, waste minimization, toxicity characterization, and wastewater treatability. Methods included Toxicity Reduction Evaluations, Facility Information Technologies, Product Modification Research, Chemical and Biological Treatability Studies, Toxicity Identification Evaluations, and Raw Material Assessments. Environmental experience covers more than 10 years and encompasses Environmental, Health, Safety, and Risk Assessments.

Associate Professor (2002) and Director of Analytical Services - Institute of Textile Technology, Charlottesville, Virginia 2000-2003

Provides research and studies of current environmental problems for the international textile industry. Studies are used to identify current environmental concerns and how these concerns can be eliminated through treatment options, pollution prevention, chemical substitution, or process changes. The methods used in this research include Toxicity Reduction Evaluations, Facility Information Technologies, Product Modification Research, Chemical and Biological Treatability Studies, Toxicity Identification Evaluations, and Raw Material Assessments. Conducts fundamental environmental research to study current environmental problems including water quality testing, water quality methods, waste minimization, toxicity characterization, and wastewater treatability. Environmental research has been conducted for the Alabama Textile Manufacturer's Association (ATMA), the American Manufacturer's Institute

(ATMI), USEPA, and industry clients. Research is also conducted with the paper and food processing industries.

## **PROFESSIONAL SUMMARY (continued)**

Current research includes: 1) the use of ultrafiltration for the speciation of metal complexes in industrial effluents. 2) the use of ionic liquids for dye recovery from industrial processes and wastewater. 3) the investigation of nitrogen sources in textile mill effluents. 4) sequenced treatments for the removal of color from textile effluents. 5) the role of APEs in toxicity evaluations of industrial effluents. 6) chemical tagging of textile fabrics and yarns

Consulting services are provided and experience covers more than 15 years and encompasses Environmental, Health, Safety, and Risk Assessments, Asbestos Services, Sick Building and Indoor Air Quality Evaluations, Phase I and II Surveys, and Remediation and Phase III Surveys for numerous Private Sector, Schools, State, Federal, Industrial and Business Clients.

### Director of Operations - HLI Environmental Charlottesville, Virginia 1987-1993

Responsibilities included oversight for government compliance for clients, environmental surveys, and laboratory supervision.

### Visiting Scholar - University of Virginia, Charlottesville, Virginia 1988-1989

Responsible for fundamental research into molecular clusters containing boron under the direction of Dr. Russell Grimes.

**PROFESSIONAL SUMMARY (continued)**

Faculty Instructor, University of Virginia, Charlottesville, Virginia 1987-1988

Responsible for full course laboratory lectures for all freshman and full course lecture help sessions.

Research Assistant, University of Virginia, Charlottesville, Virginia 1980-1987

Completed fundamental research into the synthesis, structure, and chemistry of carboranes and metallocarboranes containing large substituents or ligands.

Teaching Assistant, University of Virginia, Charlottesville, Virginia 1980-1981, 1986-1987, and Clemson University, Clemson, South Carolina, 1976-1980

Completed preparation of written and oral examinations as well as supervision and grading of laboratory sections.

## **PROFESSIONAL EXPERIENCE**

- Textile, Industrial Facilities (Southeast, Central America) – Provided scientific support for the design, build, and operation of wastewater treatment facilities including studies to determine methods for the reduction of pollutants and aquatic toxicity. These studies included TRE, TIE, and aquatic toxicity studies to evaluate wastewater treatment options for industrial facilities. Studies involved production evaluation, chemical analyses, treatment options, simulated treatment systems, toxicity testing, and waste minimization.
- Textile Facilities, Industrial Facilities (Southeast) – Conducted ISO 14001 assessment and preassessment audits for textile manufacturers as a lead auditor and acted as a final reviewer for ISO 14001 and ISO 9001 audits.
- Textile Facilities, Industrial Facilities (Southeast, Mexico, Rhode Island, New Jersey) - Conducted evaluation of all chemicals used in the facilities to evaluate the impact of chemicals purchased on environmental, health, and safety concerns including toxicity of wastewater, overseas trade restrictions, eco-labeling, federal reporting, OSHA exposure assessments, and waste characterizations. Developed Code of Practice for the in-house and contract purchase of dyes and chemical products. These studies have been completed as single assessments or continuous projects that include approval of all chemicals products used and purchased.
- Textile Facilities (Southeast, New Jersey) - Conducted Environmental, Health, and Safety Assessments of multiple facilities that included facility audit and questionnaire, paperwork review, physical inspection, department and management interviews, employee interviews, photographic inspections, assessment reports, and report presentations. General areas covered include environmental regulations, environmental liability, safety-accident prevention, OSHA compliance, fire and loss prevention, occupational health, product safety, and production machinery.
- Textile Facility, North Carolina - Conducted testing of emissions from tenter frames to identify emission rates of North Carolina air toxic pollutants. Performed SCREEN1 modeling to demonstrate acceptable ambient levels at facility fenceline.
- American Textile Foundation (ATF) Research Grant 1995-1997 - Lead researcher for an American Textile Manufacturers Institute (ATMI) and USEPA funded project to study the use of ultrafiltration techniques to measure the bioavailable fractions of chromium, cobalt, copper, and nickel in textile effluents. The research is aimed at delineating an analytical method that can be used in complying with wastewater permit compliance in substitution of the USEPA's dissolved metals measurement.

## **PROFESSIONAL EXPERIENCE (continued)**

- American Textile Manufacturers Institute - Research was funded to determine the status of environmental knowledge on the subject of the environmental fate of metal containing textile dyes. This work involved work with dye manufacturers, textile facilities, and academic institutions. The information was compiled based on specific research studies on dyes and current scientific knowledge that allows predictions of the fate.
- Alabama Textile Manufacturers Institute - Lead researcher for an Alabama Textile Manufacturers Association (ATMA) funded project to study the use of separation techniques to measure the fractions of chromium, cobalt, copper, and nickel in textile effluents. The research was aimed at delineating an analytical method that did not require advanced instrumental methods.
- Textile Facilities (North Carolina, Virginia) - Conducted fabric sampling, stock sampling, and ambient air monitoring to determine potential formaldehyde emissions from tenter frames and potential off-site impacts of emissions.
- Industrial, Commercial Facilities (Southeast) - Performed Risk Assessments for Hazardous Identification, Exposure Potential, Toxicological Characterization, and Final Risk Assessment.
- Textile, Industrial Facilities (Virginia, Maryland) - Conducted Indoor Air Quality Assessments which included HVAC System Evaluations, Building Material Evaluations, Worker Interviews, Outside Contamination Source Determinations, Environmental Condition Evaluations, Air Component Evaluations, Airborne Chemical Evaluations, Airborne Particulate Evaluations, Asbestos Evaluations, and Regulatory Compliance.

## SELECTED PUBLICATIONS AND REPORTS

“Simple Dyeability - A New Measure of Cotton Maturity” Boyter, Jr., H.A.; Li, S. In Preparation

“The Properties of Dyestuffs in Ionic Liquids” Boyter, Jr., H.A.; Li, S. In Preparation

“Dyeing With Ionic Liquid Solvents” Boyter, Jr., H.A.; Li, S. In Preparation

“Distinguishing Between Free Metal and Premetallized Dyes in Textile Effluents by Ultrafiltration” Boyter, Jr., H.A.; Baughman, G.L.; O'Neal, W.G. In Preparation.

“This is not CSI ... 10 things you need to know when submitting textiles for lab testing” Boyter, H., *AATCC Rev.* **2008**, 8 (5), 6-7.

“Effect of finishing methods on washing durability of microencapsulated aroma finishing” Li, S. Q.; Lewis, J. E.; Stewart, N. M.; Qian, L.; Boyter, H., *J. Text. Inst.* **2008**, 99 (2), 177-183.

“Decolorizing textile dye wastewater by anoxic/aerobic treatment” Smith, B.; O'Neal, G.; Boyter, H.; Piszczek, J., *J. Chem. Technol. Biotechnol.* **2007**, 82 (1), 16-24.

“Sustainability – Just a PR Gimmick?” Boyter, Henry, Presented at AATCC Fashion Garment Washing: Trends, Fabrics, Technologies & Sustainability Symposium. Long Beach, CA, December 13, 2007.

“Environmental Legislation USA” Boyter, Henry, In *Environmental Aspects of Textile Dyeing*; Christie, R.M., Ed.; Woodhead Publishing Limited:Cambridge, 2007;30-43.

“Washfastness Improvement for Heavy Shade Microdenier Nylon 6,6, Fabric” Li, Shiqi; Boyter, Henry *AATCC Review* 2005, 5(8), 36-40.

“UV Curing For Encapsulated Aroma Finish On Cotton” Li, S.; Boyter, H.; Qian, L.. *Journal of the Textile Institute* 2005, 96(6),407-411.

“Ultraviolet (UV) Curing Processes For Textile Coloration” Li, Shiqi; Boyter, Henry; Stewart, Neil *AATCC Review* 2004, 4(8), 44-49.

“Improved Flow Uniformity of Dye Liquor Using Non-Uniform Package Density Profiles” Karst, David; Yiqi Yang; Boyter, Henry; O'Neal, Gilbert; Balmforth, Dennis. *AATCC Review*, 2004, 4(3), 31-34.



## **SELECTED PUBLICATIONS (continued)**

“Effect of Finishing Methods on Washing Durability of Microencapsulated Fragrant Finishing” Shiqi Li (presenter), Joy E. Lewis, Neil M. Stewart, Lei Qian, and Henry Boyter Jr. AATCC Conference 2004.

“Best Management Practices (BMPs) For The Use of APEs in Textile Manufacturing” Prepared for the APE Research Council August 20, 2001.

"Toxicity Reduction Evaluation - Toxicity Identification Evaluation, City of Troy, Alabama". October 31 1999.

"Toxicity Reduction Evaluation (TRE), Sugar Creek Wastewater Treatment Plant, Alexander City, Alabama". May 1, 1998

"Limited Air Quality Assessment - Meriwether Lewis Elementary - Charlottesville, VA.". March 23, 1998.

“Dye Lab Assessment of a North Carolina Textile Facility”. November 11, 1997.

“Investigation Of The Use of Ultrafiltration For The Speciation Of Metals In Wastewater Effluents” Boyter, Jr., H.A.; O'Neal, W.G. Prepared For The American Textile Foundation Under USEPA Grant X-823590-01-0 Grants Operation Division June 9, 1997.

“Evaluation of Dye bath Reuse Alternatives For Source Reduction of Salts” Boyter, Jr., H.A.; O'Neal, W.G. April 9, 1997.

“Copper Ultrafiltration Study of a Textile Facility”. February 1, 1997.

“Textile Fabric Biocide - WWTP Inhibition and Aquatic Toxicity”. February 21, 1996.

"An Assessment of the Fate of Metals Contained in Textile Dyes" Boyter, Jr., H.A.; O'Neal, W.G. Prepared For the American Textile Manufacturers Institute, Jan 20, 1994.

"Results of a Study to Determine Bioavailable Metals in Textile Effluents" Boyter, Jr., H.A.; O'Neal, W.G. Prepared For the Alabama Textile Manufacturers Association, June 13, 1994.

"Chlorine Demand Characterization of Effluent - Industrial Facility". September 13, 1993.

"nido-Carborane Building Block Reagents. 3. Cyclic and Open-Chain Oligomers Incorporating-CB<sub>4</sub>H<sub>6</sub>C-Units. 'Crown' Carboranes" Boyter, Jr., H.A.; Grimes, R.N. *Inorganic Chemistry* 1988, 27(18), 3080-3084

**SELECTED PUBLICATIONS (continued)**

"nido-Carborane Building-Block Reagents. 2. Bulky-Substituent (Alkyl)<sub>2</sub>C<sub>2</sub>B<sub>4</sub>H<sub>6</sub> Derivatives and (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>C<sub>2</sub>B<sub>4</sub>H<sub>6</sub> - Synthesis And Properties" Boyter, Jr., H.A.; Grimes, R.N. *Inorganic Chemistry*, 27(18), 3075-3079

"A Useful Sublimation and Short-path Apparatus" Boyter, Jr., H.A.; Shoup, W. J. *Chem. Ed.* 1988, 65(7), 631.

"Seven-vertex Phosphinohalometallacarboranes of Iron, Cobalt, And Nickel: Synthesis, Structures, and Reactions" Boyter, Jr., H.A.; Swisher, R.G.; Sinn, E.; Grimes, R.N. *Inorganic Chemistry* 1985, 24(23), 3810-3819.