Benjamin T. Manard, PhD

R&D Staff Scientist – Analytical Chemist
Chemical & Isotopic Mass Spectrometry Group
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Department of Energy Q-Clearance (active since August 2014)

EDUCATION

Clemson University, Clemson, SC **May 2014**
Ph.D. in Analytical Chemistry

Georgia Southern University, Statesboro, GA **May 2009**
B.S. in Chemistry

RESEARCH EXPERIENCE

R&D Staff Scientist – Analytical Chemist **2018 - present**
Oak Ridge National Laboratory, Oak Ridge, TN
Nuclear Analytical Chemistry and Isotopics Laboratory
Research area: Development and implementation of atomic spectroscopy and mass spectrometric instrumentation (ICP-OES/MS) for the analysis of nuclear materials for elemental and isotopic information.

Scientist II **2016 — 2018**
Los Alamos National Laboratory, Los Alamos, NM
Chemistry-Actinide Analytical Chemistry Group
Research area: Development of miniaturized separation/sample preparation methods for trace metal analysis and impurities of bulk nuclear materials. Trace elemental analysis in bulk actinide materials (plutonium and uranium) by inductively coupled plasma mass spectrometry / optical emission spectroscopy. Ion chromatography – isotope dilution – high resolution – inductively coupled plasma – mass spectrometry for trace metal analysis in bulk nuclear materials. Pu-238 trace metal analysis for NASA related projects by direct current arc spectroscopy. Primary lead for investigation of laser ablation-based techniques for solid analysis.

Glenn T. Seaborg Postdoctoral Fellow **2014—2016**

Los Alamos National Laboratory, Los Alamos, NM
Chemistry-Actinide Analytical Chemistry Group
Research area: Development of miniaturized separation/sample preparation methods for trace metal analysis and impurities of bulk nuclear materials.

Research Mentor: **Ning Xu**
Research Co-Mentor: **Alonso Castro**

Graduate Research Assistant **2009—2014**
Clemson University, Clemson, SC
Department of Chemistry
Research area: Miniaturization of chemical analysis tools: micro-solid phase extraction tips for protein extractions and development of a miniaturized glow discharge source for elemental analysis.

Research Advisor: **R. Kenneth Marcus**

Visiting Scientist **2014**
Pacific Northwest National Laboratory, Richland, WA
Environmental Molecular Sciences Laboratory
Research area: Miniaturization of a microplasma ionization source for elemental isotopic analysis by mass spectrometry.

Research Mentor(s): **Dave Koppenaal**

Visiting Scientist **2013**
Lawrence Berkeley National Laboratory, Berkeley, CA
Environmental Energy Technologies
Research area: Laser ablation studies into the liquid sampling-atmospheric pressure glow discharge, particularly understanding fundamental plasma properties.

Research Mentor: **Richard E. Russo**

Undergraduate Research Assistant **2007—2009**
Georgia Southern University, Statesboro, GA
Research area: Improvement of iron zeolites employment for adipic acid production.

Research Advisor: **L. Shannon Davis**

OTHER WORK

Georgia Southern Chemistry Department **2008—2009**

Statesboro, GA
Analytical Chemistry / Instrumental Analysis Assistant: instrumentation maintenance, calibration, and performance testing.

TEACHING EXPERIENCE

Instrumental Analysis Laboratory	**Clemson University; Georgia Southern University**
Analytical Chemistry	**Georgia Southern University**
General Chemistry Laboratory (I and II)	**Clemson University; Georgia Southern University**
Organic Chemistry Laboratory (I and II)	**Georgia Southern University**

PEER REVIEWED PUBLICATIONS (* denotes first or corresponding author 22/47)

*47. **B.T. Manard**, H.A. Andrews, C.D. Quarles, V.C. Bradley, P. Doyle, N.A. Zirakparvar, D.R. Dunlap, C.R. Hexel, **"Exploration of LIBS as a Novel and Rapid Elemental Mapping Technique of Nuclear Fuels in the Form of Surrogate TRISO Particles"**, Accepted for publication in *J. Anal. Atom. Spectrom*, **2023**.

46. J.V. Goodwin, **B.T. Manard**, B.W. Ticknor, K.T. Rogers, C.R. Hexel, P. Cable-Dunlap, R.K. Marcus, **"Preliminary Investigation of an Uncertainty Budget for Uranium Isotope Ratio Analysis Using a Liquid Sampling – Atmospheric Pressure Glow Discharge / Orbitrap Mass Spectrometer System"**, Accepted for publication in *J. Radioanal. Nucl.*, **2023**.

*45. **B.T. Manard**, V.C. Bradley, C.D. Quarles, L. Hendriks, D.R. Dunlap, C.R. Hexel, P. Sullivan, H.B. Andrews, **"Towards Automated and High-Throughput Quantitative Sizing and Isotopic Analysis of Nanoparticles via Single Particle-ICP-TOF-MS"**, *Nanomaterials*, **2023**, 13(8), 1322. **This article is highlighted on the front cover.**

44. L. Sadergaski, **B.T. Manard**, H.A. Andrews, **"Analysis of Trace Elements in Uranium by Inductively Coupled Plasma – Optical Emission Spectroscopy, Design of Experiments, and Partial Least Squares Regression"**, *J. Anal. At. Spectrom*, **2023**, 38, 800-809. **This article is highlighted on the front, inside, cover.**

*43. V.C. Bradley, C.R. Hexel, T.L. Spano, C.V. Thompson, B.W. Ticknor, D.R. Dunlap, S.C. Metzger, **B.T. Manard**, **"Analysis of Solid Uranium Particulates on Cotton Swipes with an Automated Microextraction-ICP-MS System"**, *Anal. Methods*, **2022**, 14, 4466-4473. **This article is highlighted on the front cover.**

42. B.D. Roach, K.T. Rogers, N.A. Zirakparvar, J.S. Delashmitt, S.C. Metzger, **B.T. Manard**, T.J. Keever, J. M. Giaquinto, C.R. Hexel, **"Need for Speed- Burnup Determination of Spent Nuclear Fuel"**, *Talanta Open*, **2022**, 6, 100152.

*41. **B.T. Manard**, C.J. Hintz, C.D. Quarles Jr., W. Burns, N.A Zirakparvar, D.R. Dunlap, T. Beiswenger, A.M. Cruz-Uribe, J.A. Petrus, and C.R. Hexel, **"Determination of Fluorine Distribution in Shark Teeth by Laser Induced Breakdown Spectroscopy"** *Metallomics*, 14(6) **2022**.

40. N.A. Zirakparvar, **B.T. Manard**, C.R. Hexel, D. Dunlap, **"Investigation of the 176Yb Interference Correction During Determination of the 176Hf/177Hf Ratio by Laser Ablation and Solution Analysis on the Neoma MC-ICP-MS"**, *Minerals*, **2022**, 12, 882, 1-15.

*39. V.C. Bradley, T.L. Spano, S.C. Metzger, B.W. Ticknor, D. Dunlap, N.A. Zirakparvar, B.D. Roach, C.R. Hexel, **B.T. Manard**, **"Direct Isotopic Analysis of Solid Uranium Particulates on Cotton Swipes by Microextraction-ICP-MS"**, *Anal. Chim. Acta*, **2022**, 1209, 339836.

38. J. Denton, D.A. Bostick, S.F. Boulyga, J.A. Cunningham, I. Dimayuga, C.R. Hexel, J. Hiess, S.V. Jovanovic, P. Kaye, T. Kell, F. Kelly, W. Kinman, S. Kiser, R.E. Lindvall, Z. Macsik, **B.T. Manard**, K. Mayer, J.F. Mercier, P. Samuleev, P.R.B. Saull, Y. Shi, R.E. Steiner, B.W. Ticknor, M. Totland, Z. Varga, M. Wallenius, E.M. Wylie, **"International Interlaboratory Compilation of Trace Element Concentrations in the CUP-2 Uranium Ore Concentrate Standard"**, Accepted for publication in *J. Radioanal. Nucl.*, **2022**.

37. J. Goodwin, **B.T. Manard**, B.W. Ticknor, P.C. Dunlap, R.K. Marcus, **"Improved Uranium Isotopic Ratio Determinations for the Liquid Sampling – Atmospheric Pressure Glow Discharge Orbitrap Mass Spectrometer by use of Moving Average Processing"**, *J. Anal. At. Spectrom.,* **2022**, 37, 814-822.

*36. **B.T. Manard**, S.C. Metzger, K.T. Rogers, B.W. Ticknor, N.A. Zirakparvar, B.D. Roach, D.A. Bostick, C.R. Hexel, **"Direct Analysis of Cotton Swipes for Plutonium Isotope Determination by Microextraction-ICP-MS"**, *J. Anal. At. Spectrom.*, **2021**, 36, 10, 2202-2209.

*35. **B.T. Manard**, K.T. Rogers, B.W. Ticknor, S.C. Metzger, N.A. Zirakparvar, B.D. Roach, D.A. Bostick, C.R. Hexel, **"Direct Uranium Isotopic Analysis of Swipe Surfaces by Microextraction-ICP-MS"**, *Anal. Chem.,* **2021**, 93, 32, 11133-11139. **This article is highlighted on the front cover. Altmetric Attention Score of 57 (97th percentile of all outputs ever tracked by Altmetric)**

34. S.C. Metzger, **B.T. Manard**, D.A. Bostick, B.W. Ticknor, K.T. Rogers, E.H. McBay, D. Glasgow, N.A. Zirakparvar, C.R. Hexel, **"An Approach to Separating U, Pu, and Ti from High-Purity Graphite for Isotopic Analysis by MC-ICP-MS"**, *J. Anal. At. Spectrom.*, **2021**, 36, 6, 1095-1314. **This article is highlighted on the cover.**

*33. **B.T. Manard**, D.A. Bostick, S.C. Metzger, B.W. Ticknor, N.A. Zirakparvar, K.T. Rogers, C.R. Hexel, **"Rapid and Automated Separation of Uranium Ore Concentrates for Trace Element Analysis by ICP-OES/TQMS"**, *Spectrochim. Acta B*, **2021**, 179, 106097.

32. N. Fletcher, **B.T. Manard**, D.A. Bostick, W.D. Bostick, S.C. Metzger, B.W. Ticknor, K.T. Rogers, C.R. Hexel, **"Determination of Phosphorus and Sulfur in Uranium Ore Concentrates by Triple Quadrupole Inductively Coupled Plasma Mass Spectrometry"**, *Talanta*, **2021**, 221, 121573.

*31. **B.T. Manard**, S.C. Metzger, S. Wysor, V. Bradley, N.A. Zirakparvar, K.T. Rogers, D.A. Bostick B.W. Ticknor, C.R. Hexel, **"Trace Elemental Analysis of Bulk Thorium Using an Automated Separation – Inductively Coupled Plasma Optical Emission Spectroscopy Methodology"**, *Appl. Spectrosc.*, **2021**, 75, 5, 556-564.

*30. **B.T. Manard**, S.C. Metzger, K.T. Rogers, B.W. Ticknor, D.A. Bostick, N.A. Zirakparvar, C.R. Hexel, **"Exploration of ICP Platforms for Measuring Elemental Impurities in Uranium Ore Concentrates"**, *Int. J. Mass Spectrom.*, **2020**, 455, 116378.

29. H.W. Paing, **B.T. Manard**, B.W. Ticknor, J.R. Bills, K.A. Hall, D.A. Bostick, P. Cable-Dunlap, R.K. Marcus, **"Rapid Determination of Uranium Isotopic Abundance from Cotton Swipes: Direct Extraction via a Planer Surface Reader and Coupling to a Microplasma Ionization Source"** *Anal. Chem.*, **2020**, 92, 12, 8591-8598.

28. A. Ronne, L. He, D. Dolzhnikov, Y. Xie, M. Ge, P. Halstenberg, Y. Wang, **B.T. Manard**, X. Xiao, W.K Lee, K. Sasaki, S. Dai, S. Mahurin, Y.C. Chen-Wiegart, **"Revealing 3D Morphological and Chemical Evolution Mechanisms of Metals in Molten Salt by Multimodal Microscopy"** *ACS Appl. Mater. Interfaces,* **2020**, 12(15), 17321-17333.

27. N. Fletcher, **B.T. Manard**, S.C. Metzger, B.W. Ticknor, D.A. Bostick, C.R. Hexel, **"Determining P, S, Br, and I Content in Uranium by Triple Quadrupole Inductively Coupled Plasma Mass Spectrometry"** *J. Radioanal. Nucl.,* **2020**, (324), 395-402.

*26. V. Bradley, **B.T. Manard**, B.D. Roach, S.C. Metzger, K.T. Rogers, B.W. Ticknor, S. Wysor, J. Brockman, and C. Hexel, **"Rare Earth Element Determination in Uranium Ore Concentrates using Online and Offline Chromatography Coupled to ICP-MS"** *Minerals*, **2020**, 10(1), 1-11.

25. K.T. Bennett, S.A. Kozimor, **B.T. Manard**, V. Mocko, S.D. Pacheco, A.R. Schake, R. Wu, A.C. Olson, **"Rapid Activation Product Separations from Fission Products and Soil Matrixes"** *J. Radioanal. Nucl.*, **2019**, 322, 281-289.

*24. **B.T. Manard**, C.D Quarles, S.C. Metzger, K.T. Rogers, B.W. Ticknor, D.A. Bostick, E.H. McBay, C.R. Hexel, **"The Evaluation and Specifications for In-Line Uranium Separations with ICP-OES Detection for Trace Elemental Analysis"** *Appl. Spectrosc.,* **2019**, 73, 927-935.

23. S.C. Metzger, K.T. Rogers, D.A. Bostick, E.H. McBay, B.W. Ticknor, **B.T. Manard**, C.R. Hexel, **"Optimization of Uranium and Plutonium Separations Using TEVA and UTEVA Cartridges for MC-ICP-MS Analysis for Environmental Swipe Samples"** *Talanta*, **2019**, 198, 257-262.

*22. **B.T. Manard**, M.F. Schappert, E.M. Wylie, G.E. McMath, **"Investigation of Handheld Laser Induced Breakdown Spectroscopy (HH LIBS) for the Analysis of Beryllium on Swipe Surfaces"** *Anal. Methods,* **2019**, 11, 752-759.

21. C.D. Quarles, **B.T. Manard**, E.M. Wylie, N. Xu, **"Trace Elemental Analysis of Bulk Uranium Materials Using an In-Line Automated Sample Preparation Technique for ICP-OES"** *Talanta,* **2018**, 190, 460-465.

20. E.D. Hoegg, **B.T. Manard**, E.M. Wylie, K.J. Mathew, C.F. Ottenfeld, R.K. Marcus, **"Initial Benchmarking of the Liquid Sampling Atmospheric Pressure Glow Discharge – Orbitrap System Against Traditional Atomic Mass Spectrometry Techniques for Nuclear Applications"** *J. Am. Soc. Mass Spectrom.*, **2018**, 30, 278-288.

19. E.M. Wylie, **B.T. Manard**, C.D. Quarles, L. Meyers, N. Xu, **"An Automated, Miniaturized System for the Chromatographic Removal of Uranium Matrix for Trace Element Analysis by ICP-OES"** *Talanta,* **2018**, 189, 24-30.

*18. **B.T. Manard**, E.M. Wylie, and S.P. Willson, **"Analysis of Rare Earth Elements in Uranium by Handheld Laser Induced Breakdown Spectroscopy (HH LIBS)"** *Appl. Spectrosc.*, **2018**, 72 1653-1660.

*17. **B.T. Manard**, C. D. Quarles, E. M. Wylie, N. Xu, **"Laser Ablation – Inductively Coupled Plasma – Mass Spectrometry / Laser Induced Breakdown Spectroscopy: a Tandem Technique for Uranium Particle Characterization"** *J. Anal. At. Spectrom.*, **2017**, 9, 1611-1822. **This article is highlighted on the front cover of JAAS. This article is highlighted in JAAS as "Recent HOT articles"**.

16. R. K. Marcus, **B.T. Manard,** C. D. Quarles, **"Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) Microplasmas for Diverse Spectrochemical Analysis Applications"** *J. Anal. At. Spectrom.*, **2017**, 32, 706-716. **This article is highlighted in JAAS as "Recent HOT articles"**.

15. J. Gao, **B.T. Manard**, A. Castro, D. Montoya, N. Xu, R. Chamberlin, **"Solid-Phase Extraction Microfluidic Devices for Matrix Removal in Trace Element Assay of Actinide Materials"** *Talanta*, **2017**, 167, 8-13

*14. **B.T. Manard**, J. Matonic, D. Montoya, R. Jump, A. Castro, N. Xu, **"Assessment of the Excitation Temperatures and the Mg II:I Line Ratios of the Direct Current (DC) Arc Source for the Analysis of Radioactive Materials"** *J. Radioanal. Nucl.*, **2017**, 312, 385-393.

13. D. Montoya, **B.T. Manard**, N. Xu, **"Novel Sample Introduction System to Reduce ICP-OES Sample Size for Plutonium Metal Trace Impurity Determination,"** *J. Radioanal. Nucl.*, **2016**, 307, 2009-2014

12. L.X. Zhang, **B.T. Manard**, B. Powell and R. K. Marcus, **"Preliminary Assessment of Potential for Metal-Ligand Speciation in Aqueous Solution via the Liquid Sampling- Atmospheric Pressure Glow Discharge (LS-APGD) Ionization Source: Uranyl Acetate,"** *Anal. Chem.*, **2015**, 87, 7218-7225.

*11. **B.T. Manard**, S. Harris, and R. K. Marcus, "**Capillary-Channeled Polymer (C-CP) Fibers for the Rapid Extraction of Proteins from Urine Matrices Prior to Detection with MALDI-MS," 2014,** *Proteomics Clin. Appl.* in a special issue regarding Urine Proteomics, **2015,** 9, 522-530.

*10. **B.T. Manard**, S. Konegger-Kappel, J.J. Gonzalez, J. Chirinos, M. Dong, X. Mao, R.E. Russo, and R. K. Marcus, **"Liquid Sampling-Atmospheric Pressure Glow Discharge as a Secondary Excitation**

Source for Laser Ablation-Generated Aerosols: Parametric Dependences and Robustness to Particle Loading," *Appl. Spectrosc.*, **2015,** 69, 58-66.

9. S. Konegger-Kappel, **B.T. Manard**, L.X. Zhang, T. Konegger, R. K. Marcus, **"Liquid Sampling-Atmospheric Pressure Glow Discharge Excitation of Atomic and Ionic Species,"** *J. Anal. At. Spectrom.* for inclusion in the special issue dedicated to Barry Sharp, **2014,** 30, 285-295.

8. L.X. Zhang, **B.T. Manard**, Stefanie Konegger Kappel, and R.K. Marcus, **"Evaluation of the Operating Parameters of the Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) Ionization Source for Elemental Mass Spectrometry,"** *Anal. Bioanal. Chem.*, special issue regarding emerging concepts and strategies with analytical glow discharges, **2014**, 406, 7497-7509.

*7. **B.T. Manard**, J.J. Gonzalez, A. Sarkar, X. Mao, L. X. Zhang, S. Konegger-Kappel, R. K. Marcus, and R.E. Russo, **"Investigation of Spectrochemical Matrix Effects in the Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) Source,"** *Spectrochim. Acta B*, **2014,** 100, 44-51.

*6. **B.T. Manard**, J.J. Gonzalez, X. Mao, A. Sarkar, M. Dong, J. Chirinos, R. E. Russo, and R. K. Marcus, **"Liquid Sampling-Atmospheric Pressure Glow Discharge as a Secondary Excitation Source: Assessment of Plasma Characteristics"** *Spectrochim. Acta B*, **2014**, 94-95, 39-47.

5. R. K. Marcus, C.Q. Burdette, **B.T. Manard**, Lynn X. Zhang, **"Ambient Desorption/Ionization Mass Spectrometry using a Liquid Sampling-Atmospheric Glow Discharge (LS-APGD) Ionization Source,"** *Analyst*, **2013**, 405, 8171-8184.

*4. **B.T. Manard**, R.K. Marcus, **"Optimization of Capillary-Channeled Polymer (C-CP) Fiber Stationary Phase Extractions of Proteins from MALDI-MS Suppressing Media,"** *Anal. Methods*, **2013**, 5, 3194-3200.

*3. **B.T. Manard** and R.K. Marcus, **"Capillary-Channeled Polymer (C-CP) Fibers as a Stationary Phase for Sample Clean-Up of Protein Solutions for Matrix-Assisted Laser Desorption Ionization Mass Spectrometry,"** *J. Am. Soc. Mass Spectrom.*, **2012**, 23, 1419-1423.

2. C. D. Quarles Jr., **B.T. Manard**, C. E. Quarles, and R. K. Marcus, **"Role of Electrode Identity in Liquid Sampling-Atmospheric Pressure Glow Discharge-Optical Emission Spectroscopy,"** *Microchem.,* **2012**, 105, 48-55.

1. J.J. Pittman, **B.T. Manard**, P.J. Kowalski, and R. K. Marcus, **"Capillary-Channeled Polymer (C-CP) Films as Processing Platforms for Protein Analysis by Matrix-Assisted Laser/Desorption Ionization Mass Spectrometry (MALDI-MS),"** *J. Am. Soc. Mass Spectrom.*, **2012**, 23, 102-107.

BOOK CHAPTERS

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1. J. Matonic, **B.T. Manard**, "Spectrochemical Measurements of Trace Elements in Actinide Materials by Direct Current Arc (DC-arc)" Published within the "The Plutonium Handbook", D.L. Clark. **2018**.

PROCEEDINGS PUBLICATIONS

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4. B. W. Ticknor, **B.T. Manard**, G. Chan, **"Review of Portable Mass Spectrometric and Alternative Techniques for Fieldable Enrichment Assay of UF6 and Related Environmental Samples"** *Proceedings of the IRMM & ESARDA Joint Virtual Annual Meeting,* August 23-26 & August 30-September 1, 2021.

3. U. Martinez, S.K. Babu, E.F. Holby, X Yin, **B.T. Manard**, P. Zelany, **"Identification of Possible Degradation Mechanisms of PGM-Free Electrocatalysts during Fuel Cell Operation"** *The Electrochemical Society*, 1542, 2018.

2. G.E. McMath, **B.T. Manard**, E.M. Wylie, S.M. Aragon, **"Trace Element Analysis of Lead and Cadmium Dissolution in Water for Nuclear Applications"**, Advances in Nuclear Nonproliferation Technology and Policy Conference, Wilmington, NC, 2018.

1. C.J. Barinaga, G. H. Hager, G.L. Hart, D.W. Koppenaal, R.K. Marcus, S.M. Jones, **B.T. Manard**, **"Toward a Fieldable Atomic Mass Spectrometer for Safeguards Applications: Sample Preparation and Ionization,"** Symposium on International Safeguards: Linking Strategy, Implementation and People, Vienna, Austria, October 20-24, 2014.

Reports

Oak Ridge National Laboratory:

14. J.S. Denton, **B.T. Manard**, et al, **"International Interlaboratory Compilation of Trace Element Concentrations in the CUP-2 Uranium Ore Concentrate Standard"** LA-UR-21-25002. 2021.

13. D.A. Bostick, **B.T. Manard**, K.T. Rogers, C.R. Hexel, N.A. Zirakparvar, B.W. Ticknor, **"DOE Uranium Ore Concentrate Round-Robin Exercise 2020: ORNL Summary"** ORNL-TM-2021/2126. 2021.

12. B. W. Ticknor, **B.T. Manard**, G. Chan, **"Review of Portable Mass Spectrometric and Alternative Techniques for Fieldable Enrichment Assay of UF6 and Related Environmental Samples-An Update"** ORNL-LTR-2021/1905. 2021.

11. K. T. Rogers, **B.T. Manard**, et al, **"Destructive Analysis of HEU Metal Report"** ORNL-SPR-2020/1511. 2020.

10. D. Bostick, B.W. Ticknor, C.R. Hexel, **B.T. Manard**, E. McBay, "**Uranium Sourcing Project 2018 – LLNL Solids SP-1 Round-Robin Exercise – ORNL Summary**" ORNL-LTR-2019/1074. 2019

Los Alamos National Laboratory:

9. **B.T. Manard**, E.M Wylie, N. Xu, L. Tandon, "**Determination of Trace Elements in Uranium by HPLC-ID-ICP-MS: NTNFC Final Report"** LA-UR-17-29583. 2017

8. A.C. Olson, K. Bennett, A. L. Keksis, J. Berger, K.S. Boland, **B. T. Manard**, et. al, "**Activation Products in Technical Nuclear Forensics: Final Report**" LA-CP-17-20363. 2017

7. **B.T. Manard**, E. M. Wylie, N. Xu, et al, **"Trace Elements in Uranium Benchmarking Study"** LA-CP-17-20350. 2017

6. A.C. Olson, K. Bennett, J. Berger, S. Bowen, S. Kozimor, **B.T. Manard**, et. al, "**(U) Activation Products in Technical Nuclear Forensics**" LA-CP-17-00097. 2017

5. A.C. Olson, K. Bennett, J. Berger, S. Bowen, S. Kozimor, **B.T. Manard**, et. al, "**(U) Activation Products in Technical Nuclear Forensics**" LA-CP-16-00589. 2016

4. **B.T. Manard**, Benjamin Byerly, Ning Xu, and Lav Tandon, **"Determination of Trace Elements in Uranium and Plutonium by HPLC-ID-ICP-MS: NTNCF First Year Report"** LA-UR-16-22162. 2016

3. A.C. Olson, K. Bennett, J. Berger, S. Bowen, S. Kozimor, **B.T. Manard**, et. al, **"Activation Products in Technical Nuclear Forensics"** LA-UR-16-24190. 2015

2. Rebecca M. Chamberlin, **B.T. Manard**, et al., ***"Process Development for Material at Risk (MAR) Reduction in Analytical Chemistry Operations: FY15 Year-End Report"*** LA-CP-15-20515. 2015

1. Ning Xu, **B.T. Manard**, et al., ***"FY 14 Material at Risk MAR Reduction Report on Trace Elemental Analysis"*** LA-CP-14-20145. 2014

CONFERENCE / INVITED PRESENTATIONS

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19. **"Don't wait, ABLATE! High speed laser ablation for elemental and isotopic mapping"** B.T. Manard**,** ***Invited presentation*** at the Glenn T. Seaborg Initiative (GTSI) External Workshop, Oak Ridge National Laboratory, May 11, 2023.

18. **"*From Sample to Isotopic Measurement – Unique Ways ORNL is Utilizing Innovative Sample Introduction"*** B.T. Manard, ***Invited presentation*** withing the Radioisotope Portfolio Seminar Series, Oak Ridge National Laboratory, October 13, 2022.

17. **"*Direct Analysis of Swipe Surface for Uranium by a Novel Microextraction-ICP-MS Approach"*** B.T. Manard, ***Invited presentation*** at The Great Scientific Exchange (SciX), Greater Cincinnati, OH, October 06, 2022.

16. ***"The Employment of ICP-MS for the Analysis of Nuclear Materials"*** B.T. Manard, ***Invited presentation*** at The Great Scientific Exchange (SciX), Atlanta, GA, October 13-18, 2018.

15. ***"Trace elements in uranium benchmarking study – emphasis on the HPLC-ID-ICP-MS methodology"*** B.T. Manard, E.M Wylie, N. Xu, D. Montoya, S. Aragon, M.S. Rearick, M.F. Schappert, L. Tandon. Methods and Applications of Radioanalytical Chemistry, Kailua-Kona, HI, April 8-13, 2018.

14. ***An Analytical Chemist's Journal from Clemson to Los Alamos – with focus on the Actinide Analytical Chemistry Capabilities and Research at Los Alamos National Laboratory" Invited presentation*** at Clemson University Chemistry Department Seminar Series, Clemson, SC, November 9, 2017.

13. "***Laser based chemical analysis technique for the characterization and mapping of uranium particles*****"** B.T. Manard, C.D Quarles Jr, N. Xu, and E.M. Wylie, ***Invited presentation*** to the Young Scholars Symposium at the Rocky Mountain Regional Meeting, Loveland, CO, October 25-28, 2017.

12. ***"The Liquid Sampling – Atmospheric Pressure Glow Discharge: A Miniaturized Plasma for Giant Problems in Nuclear Forensics"*** B.T. Manard, N. Xu, A. Castro, and R.K. Marcus, ***Invited presentation at*** The Great Scientific Exchange (SciX), Providence, RI, September 27 – October 2, 2015.

11. ***"DC Arc Spectroscopy – Plasma Characterization for Direct Solid Analysis of Nuclear Materials"*** B.T. Manard, J. Matonic, R. Jump, D. Montoya, A. Castro, and N. Xu, The Great Scientific Exchange (SciX), Providence, RI, September 27 – October 2, 2015.

10. ***"Integrating Microfluidics for the Miniaturization of Nuclear Material Analysis Techniques"*** B.T. Manard, N. Xu, J. Gao, Q. MuCulloch, R. Chamberlin, D. Montoya, and A. Castro, Methods and Applications of Radioanalytical Chemistry, Kailua-Kona, HI, April 12-17, 2015.

9. ***"Assessment of the Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) as an Ambient Desorption/Ionization Source for Mass Spectrometry"*** B.T. Manard, L.X. Zhang, and R.K. Marcus, Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Chicago, IL, March 2-4, 2014.

8. ***"Assessment of Capillary-Channeled Polymer (C-CP) Films Employed for Protein Separations Prior to Analysis by MALDI-MS"*** B.T. Manard and R.K. Marcus, Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Chicago, IL, March 2-4, 2014.

7. ***"Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) as a Secondary Excitation Source: Assessment of Plasma Characteristics"*** B.T. Manard, J.J. Gonzalez, M. Dong, A. Sarkar, J. Chirinos, X. Mao, R.E. Russo, R.K. Marcus, presented at Winter Conference on Plasma Spectrochemistry, Amelia Island, FL, January 6-11, 2014.

6. ***"Assessment of the Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) Rotational Temperature, Excitation Temperature, and Electron Number Density"*** B.T. Manard, J.J. Gonzalez, M. Dong, A. Sarkar, J. Chirinos, X. Mao, R.E. Russo, and R.K. Marcus, The Great Scientific Exchange (SCIX), Milwaukee, WI, September 29-October 4, 2013.

5. ***"Evaluation of an Ambient Desorption/Ionization Source Utilizing a Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) for Mass Spectrometry,"*** B.T. Manard, C.Q. Burdette, and R.K. Marcus, Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Philadelphia, PA, March 17-21, 2013.

4. "***Optimization of Capillary-Channeled Polymer (C-CP) Fiber Packed Micro-SPE Tips for Extraction of Proteins Prior to MALDI-MS Analysis,"*** B.T. Manard and R.K. Marcus, Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy, Philadelphia, PA, March 17-21, 2013.

3. ***"Separation of Proteins on Capillary-Channeled Polymer (C-CP) Films with Analysis by Matrix-Assisted Laser Desorption Ionization-Mass Spectrometry (MALDI-MS),"*** B.T. Manard, J.J. Pittman, and R.K. Marcus, Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy, Orlando, FL, March 11-15, 2012.

2. ***"Investigation of the Effects of Electrode Material and Geometry in Liquid Sampling-Atmospheric Pressure Glow Discharge (LS-APGD) Microplasma Emission Spectroscopy and the Potential for Chromatography,"*** B.T. Manard, C.D. Quarles, Jr., C.Q. Burdette, and R.K. Marcus, Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy, Orlando, FL, March 11-15, 2012.

1. ***"Separation of Proteins on Capillary-Channeled Polymer (C-CP) Films with Analysis by Matrix-Assisted Laser Desorption Ionization-Mass Spectroscopy (MALDI-MS),"*** B.T. Manard and R.K. Marcus, Pittsburg Conference on Analytical Chemistry and Applied Spectroscopy, Atlanta, GA, March 13-18, 2011.

NEWS ARTICLES

1. https://phys.org/news/2021-10-quick-uranium-isotopes-safeguard-nuclear.html

2. https://www.ans.org/news/article-3353/ornl-researchers-employ-extraction-probe-for-rapid-safeguards-analysis/

3. https://www.ornl.gov/news/quick-detection-uranium-isotopes-helps-safeguard-nuclear-materials

4. https://www.eurekalert.org/news-releases/931727

5. https://www.sciencedaily.com/releases/2015/05/150526124904.html

6. https://theanalyticalscientist.com/power-list/2022/benjamin-t-manard

SKILLS/ABILITIES

- Experience operation and maintenance of a wide variety of analytical instrumentation including high performance liquid chromatography (HPLC), ion chromatography (IC), and gas chromatography (GC) with ultraviolet-visible (UV-Vis) spectroscopy and mass spectrometry (MS) - based detection systems. Ionization/excitation sources include electrospray ionization (ESI), matrix-assisted laser desorption/ionization (MALDI), liquid-sampling atmospheric glow discharge (LS-APGD), electron ionization (EI), and a **focus on inductively coupled plasma (ICP)**. **Experienced user of all ICP-based platforms (optical spectroscopy, quadrupole-MS, sector field-MS (single detector and multi-collector). Experienced user of laser-based techniques such as laser ablation-ICP-MS and laser induced breakdown spectroscopy (LIBS).** Experienced user of microscopy-based platforms including scanning electron microscopy (SEM) with energy dispersive X-ray spectroscopy (EDS) and particle manipulation (micromanipulator)

- Experienced in bench-top and glove box chemistry. Particularly dissolutions and separations of actinide materials.

- Trained and experienced in handling radioactive materials.

- Trained and experienced in clean-room chemistry.

Awards

The Analytical Scientist **Power List: Top 40 Under 40** **2022**
"Analytical science's rising stars"

Department of Energy Secretary's Honor Award **2022**
"DOE's highest form of employee recognition for excellence and achievements"

Journal of Analytical Atomic Spectroscopy **Featured Young Analytical Scientist** **2017**

Glenn T. Seaborg Postdoctoral Fellow **2015**

Professional Societies & Activities

Applied Spectroscopy Practica
Associate Editor **2023-Present**
Editorial Advisory Board **2023-Present**

Society for Applied Spectroscopy:

Member	**2011-Present**
Governing Board Member	**2023-Present**
Atomic Spectroscopy Student Award Co-Chair	**2019-Present**
Executive Committee, Parliamentarian	**2015-2020**
Lester Strock Award Committee	**2017, 2018**
Nomination Committee	**2018-2020**
Constitution and Bylaws Committee	**2019-2021**

Federation of Analytical Chemistry and Spectroscopy Studies (FACSS):

Atomic Spectroscopy Co-Chair	**2019-Present**

Los Alamos National Laboratory:

Glenn T. Seaborg Post-doctoral Fellow	**2015-2016**

National Postdoctoral Association, **Past Member** **2014-2016**

Los Alamos Postdoctoral Association:

Past Member	**2014—2016**
Treasurer	**2015**
Vice President	**2016**

Clemson University Chemistry Graduate Student Organization, **Past member** **2009—2014**

REFERENCES

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