**Benjamin T. Manard, PhD**

R&D Staff Scientist – Analytical Chemist

Chemical & Isotopic Mass Spectrometry Group

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Oak Ridge National Laboratory

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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**

**Senior R&D Staff 2024 - present**

Group Leader – Chemical & Isotopic Mass Spectrometry Group

Oak Ridge National Laboratory, Oak Ridge, TN

Research area: Development and implementation of advanced analytical atomic spectroscopy and mass spectrometric instrumentation (ICP-OES/MS) for the analysis of materials.

**R&D Staff Scientist – Analytical Chemist 2018 - 2024**

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. Pu-238 trace metal analysis for NASA related projects by direct current arc spectroscopy.

**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.

**PEER REVIEWED PUBLICATIONS (\* denotes first or corresponding author 29/62)**

62. N.A. Zirakparvar, **B.T. Manard**, M. Darnell, D.R. Dunlap, C.R. Hexel, S.C. Metzger, B.W. Ticknor, **“Exploration of metallic interferences pertinent to nuclear safeguards related uranium isotopic radio measurement on the Neoma MC-ICP-MS platform without the MS/MS option”**, Accepted for publication in *Int. J. Mass. Spectrom*, **2024**.

61. N.A. Zirakparvar, **B.T. Manard**, D.R. Dunlap, C.R. Hexel, **“A preliminary investigation into the feasibility for laser ablation U-Pb isotope ratio measurements via all Faraday cup detection with 1011 & 1013 Ω amplifiers on the Neoma MC-ICP-MS”**, Accepted for publication in *R. Commun. Mass Spectrom*, **2024**.

\*60. **B.T. Manard**, C.D. Quarles Jr, V.C. Bradley, T.L. Spano, N.A. Zirakparvar, B.W. Ticknor, D.R. Dunlap, P. Cable-Dunlap, C.R. Hexel, H.B. Andrews, **“Uranium single particle analysis for simultaneous fluorine and uranium isotopic determinations via LIBS/LA-MC-ICP-MS”**, *J. Am. Chem*, **2024**, 146, 14856-14863.

59. B.R. LaFreniere, B. Donahue, J.E. Price, A. Cruz-Uribe, N. Miller, **B.T. Manard**, R. McBride, J.A. Mohan, **“Chemical clocks: using otolith geochemistry to enhance estimation of age and growth of white hake (*Urophycis tenuis*)”** *Fish. Bull*. **2024,** 44-57.

\*58. V.C. Bradley, **B.T. Manard**, L. Hendriks, D.R. Dunlap, A.N. Bible, A. Sedova, P. Saint-Vincent, B.C. Sanders, H.B. Andrews, **“Quantifying platinum binding on protein-functionalized magnetic microparticles using single particle-ICP-TOF-MS**, *Anal. Methods*, **2024**, 16, 3192-3201**. This article is highlighted on the cover.**

57. T.L. Spano, H.B. Andrews, A. Miskoweic, T.N. Beiswenger, **B.T. Manard**, **“Spatially Resolved Raman Spectroscopic Investigation of UO2F2: A Case Study in the Importance of Instrument Optimization”**, Accepted for publication in *Appl. Spectrosc.*, **2024**.

\*56. V.C. Bradley, J. Burleson, H.B. Andrews, C.V. Thompson, T.L. Spano, D.R. Dunlap, N.A. Zirakparvar, B.W. Ticknor, C.R. Hexel, **B.T. Manard**, **“Mapping of uranium particles on J-type swipe with microextraction-ICP-MS”** *Analyst*, **2024**, 149, 2244-2251. **This article is highlighted on the cover.**

55. T. Wang, H. Luo, Y. Bai, I. Belharourak, K. Jayanthi, M.P. Paranthaman, **B.T. Manard**, E.T. Wang, F. Dogan, S.B. Son, B.J. Ingram, Q. Dai, S. Dai, **“Direct recycling of spent nickel-rich cathodes in reciprocal ternary molten salts”** *J. Power Sources*, **2024**, 593, 15, 233798.

\*54. J. Goodwin, **B.T. Manard**, B.W. Ticknor, P. Cable-Dunlap, R. K. Marcus, **“Investigation of potential polyatomic interferences on uranium isotope ratio measurements for the LS-APGD-Orbitrap MS system”** *Microchem*., **2024**, 196, 109645.

\*53. H.B. Andrews, C.D. Quarles, V.C. Bradley, T.L. Spano, J.A. Petrus, B. Paul, N.A. Zirakparvar, D.R. Dunlap, C.R. Hexel, **B.T. Manard**, “**Advancing Elemental and Isotopic Analysis of Uranium Mineral Inclusions: Rapid Screening via Laser-Induced Breakdown Spectroscopy and High-Resolution Laser Ablation-ICP-MS Mapping”** *Microchem.*, **2024**, 196, 109605.

52. T.L. Spano, T. Beiswenger, **B.T. Manard**, T.L. Ulrich, R. Hunt, A. Miskowiec, A.E. Shields, **“Structural Features of Early Fuel Cycle Taggant Incorporation for Intentional Nuclear Forensics”**, *J. Nucl. Mater.*, **2024**, 588, 154787.

51. K. Jayanthi, M.P. Paranthaman, **B.T. Manard**, A. Navrotsky, **“Effect of Anions on Delithiation of [Li-Al] Layered Double Hydroxides: Thermodynamic Insights”** *J. Phys. Chem. C.*, **2023**, 127, 49, 23879-23886.

\*50. V.C. Bradley, B.W. Ticknor, D.R. Dunlap, N.A. Zirakparvar, S.C. Metzger, C.R. Hexel, **B.T. Manard**, **“Microextraction-TQ-ICP-MS for the Direct Analysis of U and Pu from Cotton Swipes”**, *Anal. Chem.*, **2023**, 95, 43, 15867-15874. **This article is highlighted on the cover.**

49. N. A. Zirakparvar, **B.T. Manard**, S.C. Metzger, C.R. Hexel, D.A Bostick, V.C. Bradley, B.W. Ticknor, **“Review of Faraday detector uranium isotope ratio measurement: Insights from solution- and laser ablation- based sampling methodologies on Neoma MC-ICP-MS”**, *Int. J. Mass Spectrom.*, **2023**, 492, 117114.

\*48. J. Goodwin, **B.T. Manard**, B.W. Ticknor, P. Cable-Dunlap, R. K. Marcus, **“Initial Characterization and Optimization of the Liquid Sampling – Atmospheric Pressure Glow Discharge Ionization Source Coupled to an Orbitrap Mass Spectrometer for the Determination of Plutonium”**, *Anal. Chem.,* **2023**, 95, 32, 12131-12138. **This article is highlighted on the cover.**

\*47. **B.T. Manard**, H.B. 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”**, *J. Anal. At. Spectrom*, **2023**, 38, 1412-1420. **This article is highlighted on the front cover.**

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”**, *J. Radioanal. Nucl.*, **2023**, 332, 2875-2886.

\*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.B. 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. 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”**, *J. Radioanal. Nucl.*, **2023**, 332, 2817-2832.

\*42. 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.**

41. 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.

\*40. **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**.

39. 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.

\*38. 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.

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**

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**

7. R. Jubin, A. Dougan, P. Cable-Dunlap, B.W. Ticknor, J. Hewitt, **B.T. Manard**, W. Kuhne, K. McHugh, M. Nims, S. Stave, N. Stevens, **“Results of an In-Field Validation Exercise in Support of Wide-Area Environmental Sampling”** *Proceedings of the INMM 65th Annual Meeting*, July 22-25, 2024

6. V.C. Bradley, T.L. Spano, C.V. Thompson, B.W. Ticknor, P. Cable-Dunlap, D.R. Dunlap, S.C. Metzger, C.R. Hexel, and **B.T. Manard**, **“Direct Analysis of Cotton Swipes for Uranium and Plutonium Isotopic Determination by Microextraction-ICP-MS”** *Proceedings of the IRMM & ESARDA*, May 22-26, 2023.

5. **B.T. Manard**, B.W. Ticknor, V.C. Bradley, K.T. Rogers, S.C. Metzger, C.R. Hexel, **“Microextraction ICP-MS for Direct Analysis of Environmental Samples”**, Symposium on International Safeguards: Reflecting on the Past and Anticipating the Future, Vienna, Austria, October 31- November 4, 2022.

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**

28. ***“Utilization of Laser-Based Sampling for High-Throughput Particle Analysis”*** European Workshop on Laser Ablation, University of Ghent, Ghent, Belgium, July 6, 2024.

27. ***“Inductively coupled plasma – mass spectrometry (ICP-MS) for single particle analysis” Invited presentation*** to the Nuclear Security Course Lecture, University of Florida, Gainesville, FL, March 25, 2024.

26. ***“Inductively coupled plasma – mass spectrometry (ICP-MS) for single particle analysis”*** ***Invited presentation*** to the Department of Chemistry Seminar Series, University of Central Florida, Orlando, FL, March 11, 2024.

25. ***“ORNL leading the new paradigm of analytical atomic spectroscopy” Invited presentation*** to Chemical Sciences Division, Oak Ridge National Laboratory, February 7, 2024.

24. ***“Analysis of Single Uranium Particles by ICP-MS” Invited presentation*** at the Winter Conference on Plasma Spectrochemistry, Tucson, AZ, January 20, 2024.

23. ***“LIBS (and LA) as an Alternative Approach to Traditional Analytical Workflows”*** ***Invited presentation*** at the Winter Conference on Plasma Spectrochemistry, Tucson, AZ, January 18, 2024.

22. ***“Utilization of Atomic Spectroscopy at National Labs – An Early Career’s Perspective”*** B.T. Manard ***Invited presentation*** at the The Great Scientific Exchange (SciX), Sparks, NV, October 11, 2023.

21. ***“Detection of uranium in complex matrices via laser-based sampling”*** B.T. Manard**, *Invited presentation*** at the The Great Scientific Exchange (SciX), Sparks, NV, October 11, 2023.

20. ***“Automated elemental and isotopic analysis of particles with single-particle inductively coupled plasma – time of flight – mass spectrometry”***, The Great Scientific Exchange (SciX), Sparks, NV, October 10, 2023.

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”***](http://ca.pittcon.org/technical+program/TPAbstra14.nsf/0/F5B0AAAF6AEB428485257BBF004AC61C?editdocument&noprompt)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***](http://ca.pittcon.org/technical+program/TPAbstra14.nsf/0/F5B0AAAF6AEB428485257BBF004AC61C?editdocument&noprompt)***”*** 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***](http://ca.pittcon.org/technical+program/TPAbstra14.nsf/0/E082550351DC267C85257BBF0048FEC3?editdocument&noprompt)***”*** 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>

**7.** <https://blogs.rsc.org/ja/2023/11/22/jaas-emerging-investigator-lectureship-2023-recipient/?doing_wp_cron=1701780275.8654999732971191406250>

**8.** <https://www.eurekalert.org/news-releases/1009420>

**HONORS AND AWARDS**

**Society for Applied Spectroscopy – Lester Strock Award 2024**

“Substantive research in/or application of analytical atomic spectrochemistry”

***Journal of Analytical Atomic Spectroscopy* Emerging Investigator Lectureship 2023**

**Office of the Laboratory Director’s 2023 LDRD Poster Fair – “Best Project” 2023**

**North American Workshop on Laser Ablation – 2023**

“3rd place in Laser Ablation Image Contest.”

***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 AND ACTIVITES**

***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**

**Mentoring**

**Nathaniel Fletcher** (Current employee at Y-12 security complex)  **2018-2021**

**Sarah K Wysor** (Senior Scientist at AMGEN) **2019**

**Veronica C. Bradley** (Current Hoffman Postdoctoral Fellow, LBNL) **2019-2024**

**Jessica Linson** (Current University of Missouri Graduate Student) **2022**

**Jacob Burleson** (Current UC-Boulder Undergraduate Student) **2023**

**William Burns** (Current Savannah State University Graduate Student) **2019-current**

**Jordan Stanberry** (Current ORNL Postdoctoral Fellow) **2024-current**

**Sarah Szakas** (Current ORNL Postdoctoral Fellow) **2024-current**