NEIL J. WILLIAMS

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EDUCATION

2104-Present University of Tennessee Knoxville
Ph.D. Chemistry, Expected Graduation May 2017 GPA 3.40

2010 University of North Carolina Wilmington
M.S., Chemistry, Graduated May 2010. GPA 3.77

2008 University of North Carolina Wilmington
B.S., Biology , Graduated May 2008 GPA 3.00

2008 University of North Carolina Wilmington
B.A., Chemistry, Graduated May 2008 GPA 3.00

WORK EXPERIENCE

University of Tennessee–Knoxville **Knoxville, TN**

January 2014-Present

Department of Chemistry, Dai Group - Graduate Research Assistant

- Synthesized amidioxime ligands for the recovery of uranium from sea water
- Designed and synthesized new task-specific ionic liquids (ILs) for the selective extraction of middle lanthanides (Eu/Gd/Tm) from mixtures containing all the lanthanides
- Tested the ability of the task-specific ILs for selective separation of the central lanthanides using Inductively-coupled plasma mass spec (ICP-MS)
- Designed and synthesized task-specific ILs for the selective separation of americium Am from complex mixtures of lanthanides (Ln)
- Tested the ability of the task-specific ILs for selective separation of Ln/Am using radiotracers

Oak Ridge National Laboratory **Oak Ridge, TN**

October 2012-Present

Chemical Science Division, Chemical Separations Group - Post Masters Research Associate and Graduate Student Researcher

- Determine K_{sp} of relatively insoluble organic salts using UV−Vis spectroscopy
- Synthesized and designed new ligands for the selective extraction of highly charged tetrahedral anions from mixed waste containing multiple anions
- Use shape and charge based complimentary geometry and charged ligands for selective extraction from mixed waste
- Investigated the partitioning of new guanidine suppressants in the Next Generation Caustic Side Solvent Extraction (NG-CSSX) process between the organic and aqueous phases using gas chromatography and NMR
- Synthesized and tested neutral ligands and phosphonic acids for extraction of lanthanides from phosphoric acid waste streams
- Test the capability of new anion receptors/extractants for the selective extraction/binding of highly charged anion radiolabeled phosphate, sulfate, and chloride

University of Texas at Austin **Austin, TX**

August 2011-September 2012

Department of Chemistry and Biochemistry - Research Assistant

- Synthesized ligands for the selective extraction of Am from nuclear waste and cold war nuclear waste tanks
- Synthesized macrocyclic anisole spherand derivatives for the selective extraction of Li with various anions, with the overall goal of using them to selectively extract Li from sea water
- Synthesis of various substituted pyrroles for pyrrole-pyridine marcocyclic systems

Oak Ridge National Laboratory **Oak Ridge, TN**

June 2010-August 2011

Chemical Science Division, Chemical Separations Group - Research Associate Post Masters

- Development of a new improved solvent system for the extraction of Cs^{137} using varying Calixarene extractants.
- Testing new extractants for removing Cs^{137} from the Savanah River Site nuclear waste using the Next-Generation Caustic Side Solvent Extraction (NG-CSSX) process
- Testing new guanidine suppressors for use in the NG-CSSX process
- Exploratory testing of the NG-CSSX process for possible to decontaminate Cold War waste tanks at the Hanford site in Washington State
- Used ICP-OES to trace the flow of cations (Na, K, B, and Al) through the progression of the NG-CSSX process
- Study the extraction and stripping kinetics of the NG-CSSX process using Cs^{137}

University of North Carolina Wilmington **Wilmington, NC**

August 2008- June 2010

Department of Chemistry and Biochemistry - Research Assistant

- Method development for determining binding constants of ligands to metal ions by UV/Vis spectroscopy and Fluorescence spectroscopy
- Method development for determining concentrations of metals in the organic and aqueous phases of a separation of mixed metal solutions using inductively coupled plasma optical emission spectroscopy (ICP-OES)
- Synthesis of metal-ligand crystal structures for X-ray crystallography
- Organic Synthesis and characterization of new ligands by FT-IR , GC-MS, NMR.
- Designed ligands to bind selectively with metal ions
- Taught graduate and undergraduate students, how to operate instruments, laboratory procedures and techniques.

University of North Carolina Wilmington **Wilmington, NC**

January 2007-August 2008

Department of Chemistry and Biochemistry - Student Research Assistant

- Determined the pKa's and binding constants (logK's) of ligands for Cu(II) and Zn(II), due to their potential role in the neurodegeneration of the brain seen Alzheimer's Disease Patients
- Synthesized of ligands to selectively bind to specific metal ions in aqueous solutions

UNCW Center for Marine Science **Wilmington, NC**

May 2006 –August 2006

Department of Chemistry and Biochemistry - Summer Student Research Assistant

- Maintained cultures of diatoms and algae for a Natural Products Laboratory
- Isolation and purification of natural products from diatoms and algae by high performance liquid chromatography (HPLC), thin layer chromatography (TLC), column chromatography (CC), and liquid chromatography mass spec. (LC-MS)

INSTRUMENTATION AND SKILLS

Instrumentation

- Inductively Coupled Plasma (OES and MS)
- High Performance Liquid Chromatography (HPLC)
- Gas Chromatography (FID and MS)
- Liquid Chromatography MS
- UV−Vis Spectroscopy
- Infrared Spectroscopy
- Fluorescence Spectroscopy
- Germanium and Sodium Iodide (for gamma spectroscopy)
- Liquid scintillation counter (for beta decay)
- Combiflash (auto-column)
- Nuclear Magnetic Resonance (NMR) Spectroscopy (1D and 2D spectra)

Method Development

- Developed methods and determine ways to detect, resolve and separate multiple compounds and/or elements using HPLC, LC, LC-MS, ICP-OES and GC-MS

HONORS AND AWARD

- United States Department of Energy, The Secretary's Achievement Award 2013. For the Development of the Salt Waste Processing Technology in use at the Savannah River Site
- McLemore Family Summer Scholar, 2008

PEER−REVIEWED PUBLICATIONS

Quantifying the Binding Strength of Salicylaldoxime-Uranyl Complexes Relative to Competing Salicylaldoxime-Transition Metal Ion Complexes in Aqueous Solution: A Combined Experimental and Computational Study. Nada Mehio, Alexander S. Ivanov, Neil J. Williams, Richard T. Mayes, Vyacheslav S. Bryantsev, Robert D. Hancock, and Sheng Dai. In Preparation.

An Application of Molecular Recognition for the Efficient Removal of Cesium from Hanford Tank Waste by Modular Solvent Extraction. Neil J. Williams, Benjamin D. Roach, Mark W. Geeting, and Bruce A. Moyer. In Preparation.

1. Extraction separation of rare-earth ions using 1-hydroxy-6-N-octylcarboxamido-2(1H)-pyridinone as an extractant via competitive ligand complexation between aqueous and organic phases. Neil J. Williams, Chi-Linh Do-Thanh, Joseph J. Stankovich, Huimin Luo, and Sheng Dai. *RSC Adv.*, Accepted

2. Aqueous Sulfate Separation by Sequestration of $[(SO_4)_2(H_2O)_4]^{4-}$ Clusters within Highly Insoluble Imine-Linked Bis-Guanidinium Crystals. Radu Custelcean, Neil J. Williams, Charles A. Seipp,

Aleksandr Ivanov, and Vyacheslav S. Bryantsev. *Chem. – Eur. J.*, Accepted. (Featured on the Back Cover of Issue)

3. α,α',α'',α'''–*meso*-Tetrahexyltetramethyl-calix[4]pyrrole: An easy-to-prepare, isomerically pure anion extractant with enhanced solubility in organic solvents. Neil J Williams, Vyacheslav S. Bryanstev, Radu Custelcean, Charles A. Seipp, and Bruce A. Moyer. *Supramol. Chem.* Accepted.

4. A Simple Pseudo-Bicyclic Guanidinium With Structurally Directing Intramolecular Hydrogen Bonding Complexes Aqueous Sulfate with High Affinity and Selectivity. Charles A. Seipp, Neil J. Williams, Vyacheslav S. Bryanstev, Radu Custelcean, and Bruce A. Moyer. *RSC Adv.*, Web ASAP Released December 1, 2015.

5. Synthesis of Bis-1,2,4-triazines via Telescoped Condensation of [1,10]-phenanthrolines-2,9-dicarbonitrile with Aromatic 1,2-Dicarbonyls. Serene Tai, Neil J. Williams and Jesse D. Carrick. *J. Het. Chem.* 2015 Accepted, Web Early Release (Jan. 21, 2015).

6. Effect of Thermal Treatment on the Performance of the Next-Generation Caustic-Side Solvent Extraction (NG-CSSX) Solvent. Benjamin D. Roach, Neil J. Williams, and Bruce A. Moyer. *Solvent Extr. And Ion Exc.* 2015, 33, 576-591.

7. Aqueous Sulfate Separation by Crystallization Sulfate−Water Clusters. Radu Custelcean, Neil J. Williams, and Charles A. Seipp. *Angew. Chem. Int. Ed.* 2015, 54, 10525-10529. (Featured on the Inside Issue Cover)

8. Radiolytic Treatment of the Next-Generation Caustic-Side Solvent Extraction (NG-CSSX) Solvent and its effect on the NG-CSSX Process. Benjamin D. Roach, Neil J. Williams, Nathan C. Duncan, Laetita H. Delmau, Denise L. Lee, Joseph F. Birdwell Jr., and Bruce A. Moyer. *Solvent Extr. and Ion Exc.* 2015, 33, 134-151.

9. Bipyrrole-Strapped Calix[4]pyrroles: Strong Anion Receptors That Extract the Sulfate Anion. Sung Kuk Kim, Juhoon Lee, Neil J. Williams, Vincent M. Lynch, Benjamin P. Hay, Bruce A. Moyer and Jonathan L. Sessler. *J. Amer. Chem. Soc.* 2014, 136, 15079-15085

10. Cyclo[6]pyridine[6]pyrrole: A Dynamic, Twisted Macrocycle with no Meso Bridages. Zhan Zhang, Won-Young Cha, Neil J. Williams, Elise L. Rush, Masatoshi Ishida, Vincent M. Lynch, Dongho Kim and Jonathan L. Sessler. *J. Amer. Chem. Soc.* 2014, 136, 7591-7594.

11. Selectivity of the Highly Preorganized Tetradentate Ligand 2,9-Di-(pyrid-2-yl)-1,10-phenanthroline for Metal ions in Aqueous Solution, including Lanthanide(III) ions and the Uranyl(VI) cation. A Thermodynamic, Molecular Mechanics, and Crystallographic Study. Ashley N. Carolan, Gregory M. Cockrell, Neil J. Williams, Gang Zhang, Donald G. VanDerveer, Randolph P. Thummel and Robert D. Hancock. *Inorg. Chem.* 2013, 52, 15-27.

12. N,N'-Dicyclohexyl-N''-isotridecylguandinie as Suppressor for the Next Generation Caustic Side Solvent Extraction (NG-CSSX) Process. Nathan C. Duncan, Benjamin D. Roach, Neil J. Williams, Peter V. Bonnesen, Arbin Rajbanshi and Bruce A. Moyer. *Separation Science and Technology*. 2012, 47: 14-15, 2074-2087.

13. Affinity of two Highly Preorganized Ligands for the base metal ions Co(II), Ni(II) and Cu(II). A Thermodynamic, Crystallographic and Fluorometric Study. Neil J. Williams, Raymond T. Gephart III, Ashley E. Hames, Joseph H. Reibenspies, Robort C. Luckay, Alvaro S. de Sousa, and Robert D. Hancock. *Polyhedron*. 2012, 46, 136-148.

14. Synthesis and Metal Coordination Chemistry of (Phenyl)(Pyridin-2-ylmethyl)phosphinodithioic acid, [2-C5H4N]CH2P(S)(SH)(Ph). Manab Chakravarty, Sylvie Pailloux, S. Ouizem, K.A. Smith, Eileen N. Duesler, Robert T. Paine, Neil J. Williams and Robert D. Hancock., *Polyhedron.* 2012, 33, 327-335.

15. Metal Ion Complexing Properties of Dipyridoacridine, A Highly Preorganized Tridentate Homologue of 1,10-Phenanthroline. Joanna M. Hamilton, Jason R. Whitehead, Neil J. Williams, Maya El Ojaimi, Randolph P. Thummel and Robert Hancock., *Inorg. Chem.* 2011, 50, 3785-3790.

16. The complexes of the highly preorganized ligand PDALC (2,9-bis(hydroxymethyl)-1,10-phenanthroline) with trivalent Lanthanides. A Thermodynamic and Crystallographic Study. Neil J. Williams, Daniel G. Balance, Joseph H. Riebenspies, and Robert D. Hancock., *Inorg. Chim. Acta.* 2010, 363, 3694-3699.

17. Synthesis and Reactivity of (Benzoxazol-2-ylmethyl)phosphonic Acid. Sylvie Pailloux, Cornel E. Shirima, Karen A. Smith, Eileen N. Duesler, Robert T. Paine, Neil J. Williams and Robert D. Hancock., *Inorg. Chem.* 2010, 49, 9369-9379.

18. Control of metal ion size-based selectivity through chelate ring geometry. Metal ion complexing properties of 2,2'-biimidazole. David Buist, Neil J. Williams, Joseph H. Riebenspies, and Robert D. Hancock., *Inorg. Chem.* 2010, 49, 5033-5039.

19. Complexation of Mercury(I) and Mercury(II) by 18-Crown-6: Hydrothermal Synthesis of the Mercuric Nitrite Complex. Neil J. Williams, Robert D. Hancock, Joseph H. Riebenspies, Manuel Fernandes, and Alvaro S. de Sousa., *Inorg. Chem.* 2009, 48, 24, 11724-11733.

20. Complexation of Metal Ions of Higher Charge by the Highly Preorganized Tetradentate Ligand 2,9-bis(hydroxylmethyl)-1,10-Phenanthroline. A Crystallographic and Thermodynamic Study. Raymond T. Gephart III, Neil J. Williams, Joseph H. Reibenspies, Alvaro S. DeSousa, and Robert D. Hancock., *Inorg. Chem.*, 2009, 48, 18, 8201-8209.

21. Strong Metal Ion Size-based Selectivity of the Highly Preorganized ligand PDA (1,10-Phenanthroline-2,9-dicarboxylic acid) with Trivalent Metal Ions. A Crystallographic, Fluorometric, and Thermodynamic Study. Neil J. Williams, Nolan E. Dean, Donald G. VanDerveer, Robert C. Luckay, and Robert D. Hancock., *Inorg. Chem.*, 2009, 48, 17, 7853-7863.

22. Possible Steric Control of the Relative Strength of Chelation Enhanced Fluorescence (CHEF) for Zinc(II) Compared to Cadmium(II). Metal Ion Complexing Properties of Tris(2-quinolylmethyl)amine, A Crystallographic, UV-Visible, and Fluorometric Study. Neil J. Williams, Wei Gan, Joseph H. Reibenspies, and Robert D. Hancock., *Inorg. Chem.*, 2009, 48, 4, 1407-1415.

23. Metal Ion Complexing Properties of the Highly Preorganized Ligand 2,9-Bis(Hydroxymethyl)-1,10-phenanthroline: A Crystallographic and Thermodynamic Study. Raymond T. Gephart III,

Neil J. Williams, Joseph H. Reibenspies, Alvaro S. DeSousa, and Robert D. Hancock., *Inorg. Chem.* 2008, 47, 22, 10342-10348.

REPORTS AND CONFERENCE PROCEEDINGS

1.) Bruce A. Moyer, Joseph F. Birdwell, Jr., Laetitia H. Delmau, Nathan C. Duncan, Dale D. Ensor, Talon G. Hill, Denise L. Lee, Benjamin D. Roach, Frederick V. Sloop, Jr., Erica L. Stoner, and Neil J. Williams. Next Generation Solvent Development for Caustic-Side Extraction of Cesium. ORNL/TM-2013/224 REV1. Oak Ridge, TN: Oak Ridge National Laboratory. 2013

2.) Bruce A. Moyer, Laetitia H. Delmau, Benjamin D. Roach and Neil J. Williams. Thermal Degradation of the Next Generation Solvent Using Triisodecylguanudune Suppressor: Impacts on Solvent Performance and Organic Content of Aqueous Effluents. ORNL/LTR/NGCSSX-020. Oak Ridge, TN: Oak Ridge National Laboratory. 2013

3.) Bruce A. Moyer, Laetitia H. Delmau, Nathan C. Duncan, Dale Ensor, Talon G. Hill, Denise L. Lee, Benjamin D. Roach, Frederick V. Sloop Jr. and Neil J. Williams. Recommended Guanidine Suppressor for the Next-Generation Caustic-Side Solvent Extraction Process. ORNL/TM-2012/625. Oak Ridge, TN: Oak Ridge National Laboratory. 2012.

4.) Benjamin D. Roach, Neil J. Williams, Nathan C. Duncan and Bruce A. Moyer. N,N'-dicyclohexyl-N"-isotridecylguanidine Suppressor Variants for the Next Generation Caustic Side Solvent Extraction (NG-CSSX) Process. ORNL/LTR-2011/398. Oak Ridge, TN: Oak Ridge National Laboratory. 2011.

5.) Neil J. Williams , Benjamin D. Roach, Bruce A. Moyer and Denise L. Lee. Effect of Radiolytic and Thermal Treatment on the Performance of the Next Generation Caustic Side Solvent Extraction (NG-CSSX) Solvent. ORNL/LTR-2011/397. Oak Ridge, TN: Oak Ridge National Laboratory. 2011.

6.) Neil J. Williams and Bruce A. Moyer. Kinetics of Cesium Extraction and Stripping in the Next Generation Caustic Side Solvent Extraction (NG-CSSX) Process. ORNL/LTR-2011/377. Oak Ridge, TN: Oak Ridge National Laboratory. 2011.

7.) Benjamin D. Roach, Neil J. Williams*, Nathan C. Duncan and Bruce A. Moyer. Effect of Possible Impurities on the Performance of the Next Generation Caustic Side Solvent Extraction (NG-CSSX) Process. ORNL/LTR-2011/286. Oak Ridge, TN: Oak Ridge National Laboratory. 2011.

8.) Neil J. Williams and Bruce A. Moyer. Temperature Dependence of the Next Generation Caustic Side Solvent Extraction (NG-CSSX) Process. ORNL/LTR-2011/264. Oak Ridge, TN: Oak Ridge National Laboratory. 2011.

9.) Neil J. Williams and Bruce A. Moyer. Effect of High Sodium Levels on Cesium Distribution in the Next Generation Caustic Side Solvent Extraction (NG-CSSX) Process. ORNL/LTR-2011/148. Oak Ridge, TN: Oak Ridge National Laboratory. 2011.

10.) Bruce A. Moyer, Peter V. Bonnesen, Laetitia H. Delmau, Frederick V. Sloop, Neil J. Williams, Joseph F. Birdwell, Denise L. Lee, Ralph Leonard, Samuel D. Fink, Thomas B. Fink, Thomas B. Peter and Mark W. Geeting. Development of the Next-Generation Caustic-Side Extraction (NG-

CSSX) Process for Cesium Removal from High-Level Tank Waste. Waste Management 2011, Phoenix, AZ, 2011.

REFERENCES

Dr. Robert Hancock, Will S. DeLoach Distinguished Professor of Chemistry, Department of Chemistry and Biochemistry, University of North Carolina Wilmington, 601 S. College Rd., Wilmington, NC 28403. (910)962-3025, hancockr@uncw.edu

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