VICTOR RYZHOV

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PROFESSIONAL EXPERIENCE

2020 – present Professor, Department of Chemistry and Biochemistry, Northern Illinois University
2006-2020 – Associate Professor, Department of Chemistry and Biochemistry, Northern Illinois University.
2008 – (August-December) – Visiting faculty, University of Melbourne, Australia
2000-2006 – Assistant Professor, Department of Chemistry and Biochemistry, Northern Illinois University.
1998-2000 – Postdoctoral Fellow, University of Maryland, Laboratory of Prof. C. Fenselau.

EDUCATION

Ph. D. in Chemistry, 1998, Case Western Reserve University (CWRU).
Advisor: Professor Robert C. Dunbar.
M. S. in Chemistry (with Honors) / specializing in Organic Chemistry, 1992, Moscow State University (MSU), Russia.

AWARDS

Distinguished Graduate Faculty, NIU, 2017
David Raymond Award for Using Technology in Education, NIU, 2016
American Society for Mass Spectrometry Research Award, 2002.
Washington-Baltimore MSDG ASMS travel award, 1999.
Alumni Fellowship, CWRU Department of Chemistry, 1995-96.
Outstanding Teaching Assistant Award, CWRU Department of Chemistry, 1994.
Nesmeyanov Fellowship Award, MSU Department of Chemistry, 1990-92.

TEACHING EXPERIENCE (NIU)

Chemistry in Everyday Life (Chem 100)*, Introductory Chemistry (Chem 110), General Chemistry (Chem 210), Analytical Chemistry I (Chem 325), Analytical Chemistry II (Chem 425), Bioanalytical Mass Spectrometry (Chem 600B)*, Biological Mass Spectrometry (Chem 500E)*, Mass Spectrometry (Chem 623)*

*Indicates courses developed by V. Ryzhov

ADMINISTRATIVE EXPERIENCE (NIU)

2016-2017	Director of Undergraduate Studies, Department of Chemistry and Biochemistry
2017-present	Director of Graduate Studies and Assistant Chair, Department of Chemistry and Biochemistry
2004-present	NIU Homeland Security Certificate Biochemistry track co-coordinator

AFFILIATIONS

1995 – present	American Society for Mass Spectrometry
2013-2019	Editorial board member (Journal of the American Society for Mass Spectrometry)

LIST OF PUBLICATIONS

1. Klippenstein, S. J.; Yang, Y.-C.; Ryzhov, V.; Dunbar, R. C. "Theory and Modeling of Ion-Molecule Radiative Association Kinetics." *J. Chem. Phys*. **1996,** *104,* 4502.

2. Ryzhov, V.; Klippenstein, S. J.; Dunbar, R. C. "Radiative Association of NO^+ with 3-Pentanone: Rate, Binding Energy, and Temperature Dependence." *J. Am. Chem. Soc.* **1996,** *118,* 5462-5468.

3. Ryzhov, V.; Dunbar, R. C. " Size Dependence of Radiative Association Rates." *Int. J. Mass Spectrom. Ion Processes* **1997**, *167/168,* 627-635.

4. Ryzhov, V.; Yang, Y.-C.; Klippenstein, S. J.; Dunbar, R. C. "Temperature Dependence of Radiative Association Rates." *J. Phys. Chem.* A **1998**, *102,* 8865.

5. Ryzhov, V.; Dunbar, R. C. "Interactions of Phenol and Indole with Metal Ions in the Gas Phase: Models for Tyr and Trp Side-Chain Binding." *J. Am. Chem. Soc.* **1999,** *121,* 2259-2268.

6. Ryzhov, V.; Yang, C.-Y.; Klippenstein, S. J.; Dunbar, R. C. "Binding Energies of Chromium Ions with Fluorobenzenes from Radiative Association Kinetics." *Int. J. Mass Spectrom. Ion Processes* **1999,** *185/186/187,* 913-923.

7. Ryzhov, V.; Dunbar, R. C. "Direct Association Equilibrium in the FT-ICR Ion Trap: The Hydration Equilibrium of Protonated 18-Crown-6". *J. Am. Soc. Mass Spectrom.,* **1999,** *10,* 862-868.

8. Hathout, Y.; Demirev, P. A.; Ho, Y.-P.; Bundy, J. L.; Ryzhov, V.; Sapp, L.; Stutler, J.; Jackman, J. and Fenselau, C. "Identification of Bacillus Spores by MALDI Mass Spectrometry." *Appl. Environ. Microbiol.,* **1999,** *65,* 4313-4319.

9. Demirev, P. A.; Ho, Y.-P.; Ryzhov, V. and Fenselau, C. "Microorganism Identification by Mass Spectrometry and Protein Database Searches." *Anal. Chem.* **1999,** *71,* 2732-2738.

10. Ryzhov, V.; Dunbar, R. C; Cerda, B. and Wesdemiotis, C. "Cation-π effects in the Complexation of Na^+ and K^+ with Phe, Tyr and Trp in the Gas Phase." *J. Am. Soc. Mass Spectrom.* **2000,** *11,* 1037-1046.

11. Ryzhov, V.; Hathout, Y. and Fenselau, C. "Rapid Characterization of Spores of *Bacillus Cerus* Group Bacteria by MALDI-TOF Mass Spectrometry." *Appl. Environ. Microbiol.,* **2000,** *66,* 3828-3834.

12. Hathout, Y.; Ho, Y.-P.; Ryzhov, V.; Demirev, P. A. and Fenselau, C. "Kurstakins: a New Class of Lipopeptides Isolated from Bacillus thuringiensis." *J. Natur. Prod.,* **2000**, *63*, 1492-1496.

13. Ryzhov, V.; Bundy, J. L, Fenselau, C., Taranenko, N., Doroshenko, V. and Prasad, C. R. "Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Analysis of *Bacillus* Spores Using a 2.94 μm Infrared Laser." *Rapid Commun. Mass Spectrom.,* **2000,** *14,* 1701-1706.

14. Ryzhov, V. and Fenselau, C. "Characterization of the Protein Subset Desorbed by MALDI from Whole Bacterial Cells." *Anal. Chem.,* **2001**, *73*, 746-750.

15. Jellen, E. E.; Chappell, A. M. and Ryzhov, V. "Effects of Size of Non-covalent Complexes on Their Stability During Collision-induced Dissociation." *Rapid Commun. Mass Spectrom.,* **2002**, *16*, 1799-1804.

16. Hayes, L. A.; Chappell, A. M.; Jellen, E. E., and Ryzhov, V. "Binding of Metalloporphyrins to Model Nitrogen Bases: Collision-induced Dissociation and Ion-Molecule Reactions Studies" *Int. J. Mass Spectrom.,* **2003,** *227,* 111-120.

17. Armentrout, P. B. and Ryzhov, V. "Special Issue: In Honour of Robert C. Dunbar. Preface", *Int. J. Mass Spectrom.,* **2003***, 227,* vi-vii. (non-refereed)

18. Vinokur, N. and Ryzhov, V.; "Using Collision-Induced Dissociation with Corrections for the Ion Number of Degrees of Freedom for Quick Comparisons of Relative Bonding Strength." *J. Mass Spectrom.,* **2004,** *39,* 1268-1274.

19. Weinecke, A. and Ryzhov, V. "Fundamentals of Biomolecule Analysis by Electrospray Ionization Mass Spectrometry: An Instrumental Analysis Laboratory Experiment." *J. Chem. Educ.,* **2005,** *82,* 99-102.

20. Sobel, R. S.; Ballantine, D. S., and Ryzhov, V.; "Quantitation of Phenol Levels in Oil of Wintergreen Using Gas Chromatography-Mass Spectrometry with Selected Ion Monitoring: A Quantitative Analysis Laboratory Experiment." *J. Chem. Educ.,* **2005,** *82,* 601-603.

21. Jellen, E. E. and Ryzhov, V. "Probing the Stability and Structure of Metalloporphyrin Complexes with Basic Peptides by Mass Spectrometry." *Eur. J. Mass Spectrom.,* **2005,** *11,* 65-72.

22. Sunderlin, L. S.; Ryzhov, V.; Keller, L. M. M., and Gaillard, E. R. "Measuring Basicities of Amino Acids Using an Ion Trap Mass Spectrometer: A Physical Chemistry Laboratory Experiment." *J. Chem. Educ.,* **2005,** *82,* 1071-1073.

23. Taldone, F. S.; Tummala, M.; Goldstein, E. J.; Ryzhov, V.; Ravi, K. and Black, S. M. "Studying the S-nitrosylation of Model Peptides and eNOS Protein by Mass Spectrometry." *Nitric Oxide.,* **2005,** *13,*176-187.

24. Lilia A. Rousseva, Elizabeth R. Gaillard, John C. Merriam, Victor Ryzhov, Donita L.Garland, David C. Paik and James P. Dillon "Oxindolealanine in Age-related Human Cataracts." *Exp. Eye Res.*, **2007**, *85*, 861-868.

25. Black, S. M, Kumar, S., Wiseman, D., Ravi, K., Wedgwood, S., Ryzhov, V., and Fineman, J. R. "Pediatric pulmonary hypertension: Roles of endothelin-1 and nitric oxide." *Clin. Hemorheol. Microcirc.* **2007,** *37(1-2)*, 111-20. Review.

26. Tummala, M.; Ryzhov, V.; Ravi, K. and Black, S. M. "Identification of the cysteine nitrosylation sites in human endothelial nitric oxide synthase." *DNA Cell Biol.,* **2008**, *27*, 25-33.

27. Pyatkivskyy, Y. and Ryzhov, V. "Coupling of ion-molecule reactions to liquid chromatography on a quadrupole ion trap mass spectrometer". *Rapid Commun. Masss Spectrom.,* **2008,** *22*, 1288-1294.

28. Zickus, M.; Fonseca, F.V.; Tummala, M.; Black, S. M. and Ryzhov, V. "Identification of the Tyrosine Nitration Sites in Human Endothelial Nitric Oxide Synthase by Liquid Chromatography-Mass Spectrometry." *Eur. J. Mass Spectrom.,* **2008,** *14*, 239-248.

29. Victor Ryzhov, Adrian Lam, and Richard A. J. O'Hair. "Gas-Phase Fragmentation of Long-Lived Cysteine Radical Cations Formed via NO Loss from Protonated S-Nitrosocysteine." *J. Am. Soc. Mass Spectrom.* **2009,** *20,* 985-995.

30. Feketeova, L., Ryzhov, V., and O'Hair, R. A. J. "Comparison of collision- versus electron-induced dissociation of Pt(II) ternary complexes of histidine- and methionine-containing peptides" *Rapid Comm. Mass Spectrom.* **2009,** *23,* 1-11.

31. Fonseca, F.V.; Ravi, K., Wiseman, D., Tummala, M.; Harmon, C., Ryzhov, V.; Fineman, J. R. and Black, S. M. "Mass spectroscopy and molecular modeling predict endothelial nitric oxide synthase dimer collapse by hydrogen peroxide through zinc tetrathiolate metal-binding site disruption." *DNA Cell Biol.,* **2010**, *29*, 149-160.

32. Adrian Lam, Victor Ryzhov, and Richard A. J. O'Hair. **"**Mobile Protons Versus Mobile Radicals: Gas-Phase Unimolecular Chemistry of Radical Cations of Cysteine-Containing Peptides." *J. Am. Soc. Mass Spectrom.* **2010,** *21,* 1296-1312.

33. Ryzhov, V. "Mass Spectrometry and Gas-Phase Chemistry of Non-Covalent Complexes", book review, *J. Am. Chem. Soc.*, **2010,** *132*, 2468 (non-refereed)

34. Ryzhov, V. "Reactive Intermediates: MS Investigations in Solution", book review, *J. Am. Chem. Soc.*, **2010,** *132,* 16297-16298 (non-refereed).

35. Osburn, S., Steill, J. D., Oomens, J., O'Hair, R. A. J. Van Stipdonk, M. and Ryzhov, V. "Structure and Reactivity of the Cysteine Methyl Ester Radical Cation" *Chem. Eur. J.,* **2011**, *17*, 873-879.

36. Zickus, M. A., Koepke, S., Hao, C., Chong, K. and Ryzhov, V. "The thermochemical studies of protonated amine-crown ether complexes: Extension of the kinetic method" *Int. J. Mass Spectrom.* **2011,** *312*, 173-178.

37. Osburn, S., Berden, G., Oomens, J., O'Hair, R. A. J. and Ryzhov, V. "Structure and reactivity of the N-acetyl cysteine radical cation and anion: Does radical migration occur?" *J. Am. Soc. Mass Spectrom.* **2011,** *22*, 1794-1803.

38. Osburn, S., O'Hair, R. A. J., Black, S. M. and Ryzhov, V. "Post-translational modification in the gas phase: Mechanism of cysteine S-nitrosylation via ion-molecule reactions". *Rapid Commun. Masss Spectrom.,* **2011,** *25*, 3216-3222.

39. Osburn, S., O'Hair, R. A. J. and Ryzhov, V. "Gas-phase Reactivity of Sulfur-based Radical Ions of Cysteine Derivatives and Small Peptides". *Int. J. Mass Spectrom.* **2012,** *316-318*, 133-139.

40. Mishra, E., Worlinsky, J. L., Gilbert, T. M., Brückner, C. and Ryzhov, V. "Axial Imidazole Binding Strengths in Porphyrinoid Cobalt(III) Complexes as Studied by Tandem Mass Spectrometry". *J. Am. Soc. Mass Spectrom.,* **2012,** *23,* 1135-1146.

41. Osburn, S.; Berden, G.; Oomens, J.; O'Hair, R. A. J.; Ryzhov, V., "Studying S-to-αC Radical Migration in the Radical Cations of Gly-Cys and Cys-Gly". *J. Am. Soc. Mass Spectrom.,* **2012,** 23, 1019-1023.

42. Osburn, S.; Burgie, T.; Berden, G.; Oomens, J.; O'Hair, R. A. J.; Ryzhov, V., "Structure and Reactivity of Homocysteine Radical Cation in the Gas Phase

Studied by Ion-Molecule Reactions and Infrared Multiple Photon Dissociation". *J. Phys. Chem. A,* **2013,** *117*, 1144-1150.

43. Osburn, S. and Ryzhov, V., "Ion-Molecule Reactions: Analytical and Structural Tool." *Anal. Chem.,* **2013,** *85*, 769-778. **Invited Review.**

44. Piatkivskyi, A.; Osburn, S., Jaderberg, K.; Grzetic, H.; Steill, J. D.; Oomens, J.; Zhao, J.; Lau, J. K.-C.; Verkerk, U. H.; Hopkinson, A. C.; Siu, K. W. M. and Ryzhov, V. **"**Structure and Reactivity of the Distonic and Aromatic Radical Cations of Tryptophan", *J. Am. Soc. Mass Spectrom.,* **2013,** *24*, 513-523.

45. Osburn, S.; Berden, G.; Oomens, J.; Gulyuz, K.; Polfer, N. C.; O'Hair, R. A. J.; Ryzhov, V. "Structure and Reactivity of the Glutathione Radical Cation: Radical Rearrangement from the Cysteine Sulfur to the Glutamic Acid α-Carbon Atom". *Chem. Plus Chem*. **2013**, *78*, 970-978.

46. Mishra, E., Worlinsky, J. L., Brückner, C. and Ryzhov, V. "MS/MS Fragmentation Behavior Study of meso-Phenylporphyrinoids Containing Non-pyrrolic Heterocycles and meso-Thienyl-substituted Porphyrins". *J. Am. Soc. Mass Spectrom.,* **2014,** *25,*18-29.

47. Piatkivskyi, A.; Pyatkivskyy, Y.; Hurt, M. and Ryzhov, V. **"**Utilization of gas-phase ion-molecule reactions for differentiation between phospho- and sulfocarbohydrates", Eur. *J. Mass Spectrom.,* **2014,** *20*, 187-183.

48. Piatkivskyi, A.; Pyatkivskyy, Y. and Ryzhov, V. **"**Letter: Evaluation of various silicon and boron-containing compounds for the detection of phosphorylation in peptides via gas-phase ion-molecule reactions", Eur. *J. Mass Spectrom.,* **2014,** *20*, 337-344.

49. Lesslie, M.; Meyer, J. A.; Osburn, S.; Otun, S. and Ryzhov, V. "The formation of resonance-stabilized sulfur-based radical cations and their gas-phase reactivity." *Int. J. Mass Spectrom.,* **2015**, *378*, 312-321.doi:10.1016/j.ijms.2014.09.020.

50. Piatkivskyi, A.; Happ, M.; Lau, J. K.-C.; Siu, K. W. M.; Hopkinson, A. C. and Ryzhov, V. **"**Investigation of fragmentation of tryptophan nitrogen radical cation", *J. Amer. Soc. Mass Spectrom.,* **2015,** doi:10.1007/s13361-015-1134-x

51. Tolmachev, Y. V.; Piatkivskyi, A.; Ryzhov, V.; Konev, D. V. and Vorotyntsev, M. A. **"**Energy cycle based on a high specific energy aqueous flow battery and its potential use for fully electric vehicles and for direct solar-to-chemical energy conversion", *J. Solid State Electrochem.,* **2015,** doi: 10.1007/s10008-015-2805-z

52. Lesslie, M.; Osburn, S.; van Stipdonk, M. J. and Ryzhov, V. "Gas-phase tyrosine-to-cysteine radical migration in model systems." *Eur. J. Mass Spectrom.,* **2015**, *21*, 589-597.

53. Lesslie, M.; Piatkivskyi, A.; Lawler, J.; Helgren, T.; Osburn, S.; O'Hair, R. A. J.; and Ryzhov, V. "The Effects of Intramolecular Hydrogen Bonding on the Reactivity of Phenoxyl Radicals in Model Systems." *Int. J. Mass Spectrom.,* **2015**, *390*, 124-131, .doi:10.1016/j.ijms.2015.06.008.

54. Chu, I.K.; Siu, C.-K.; Lau, J. K.-C.; Tang, W.K.; Mu, X.; Lai, C.K.; Guo, X.; Wang, X.; Li, N.; Xia, Y.; Kong, X.; Oh, H.B.; Ryzhov, V.; Turecek, F.; Hopkinson, A. C. and Siu, K. W. M. "Proposed nomenclature for peptide ion fragmentation." *Int. J. Mass Spectrom.,* **2015**, *390*, 24-27. doi:10.1016/j.ijms.2015.07.021

55. Lesslie, M.; Lau, J. K.-C.; Lawler, J. T.; Siu, K. W. M.; Steinmetz, V.; Maître, P.; Hopkinson, A. C. and Ryzhov, V. "Cysteine Radical/Metal Ion Adducts: A Gas-Phase Structural Elucidation and Reactivity Study." *ChemPlusChem.,* **2016**, *81*, 444-452. DOI: 10.1002/cplu.201500558

56. Lesslie, M.; Lau, J. K.-C.; Lawler, J. T.; Siu, K. W. M.; Oomens, J.; Berden, G.; Hopkinson, A. C. and Ryzhov, V. "Alkali-Metal-Ion-Assisted Hydrogen Atom Transfer in the Homocysteine Radical." *Chem. Eur. J.,* **2016**, *22*, 2243-2246. DOI: 10.1002/chem.201504631

57. Osburn, S.; Chan, B.; Ryzhov, V.; Radom, L. and O'Hair, R. A. J. "Role of Hydrogen Bonding on the Reactivity of Thiyl Radicals: A Mass Spectrometric and Computational Study Using the Distonic Radical Ion Approach." *J. Phys. Chem. A,* **2016***, 120,* 8184–8189.

58. Ryzhov, V. "Ion/Molecule Attachment Reactions: Mass Spectrometry", book review, *J. Am. Soc. Mass Spectrom.*, **2016,** *27,* 1289 (non-refereed).

59. Lesslie, M.; Lawler, J. T.; Dang, A.; Korn, J.A.; Bím, D.; Steinmetz, V.; Maître, P.; Tureček, F. and Ryzhov, V. "Cytosine Radical Cations: A Gas-Phase Study Combining IRMPD Spectroscopy, UVPD Spectroscopy, Ion–Molecule Reactions, and Theoretical Calculations", *ChemPhysChem*, **2017**, *18*, 1293-1301, DOI: 10.1002/cphc.201700281

60. Lesslie, M.; Yang, Y.; Canty, A. J.; Piacentino, E.; Berthias, F.; Maître, P.; Ryzhov, V. and O'Hair, R. A. J. "Ligand-induced decarbonylation in diphosphine-ligated palladium acetates $[CH_3CO_2Pd((PR_2)_2CH_2)]^+$ (R = Me and Ph)", *Chem. Comm.*, **2018**, *54*, 346-349; DOI: 10.1039/C7CC08944A

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62. Ryzhov, V. and Oomens, J. "Robert C. Dunbar (June 26, 1943–October 31, 2017)" (obituary), *J. Am. Soc. Mass Spectrom.*, **2018** (non-refereed). DOI: 10.1007/s13361-017-1866-x

63. Piatkivskyi, A.; Lau, J. K.-C.; Berden, G.; Oomens, J.; Hopkinson, A. C.; Siu, K. W. M. and Ryzhov, V. **"**Hydrogen atom transfer in the radical cations of tryptophan-containing peptides AW and WA studied by mass spectrometry, infrared multiple-photon dissociation spectroscopy, and theoretical calculations", *Eur. J. Mass Spectrom.,* **2018,** *25*, 112-121. DOI: 10.1177/1469066718802547

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65. Carr, A.F.; Patel, D.C.; Lopez, D.; Armstrong, D.W and Ryzhov, V. "Comparison of Reversed-Phase, Anion-Exchange, and Hydrophilic Interaction HPLC for the Analysis of Nucleotides Involved in Biological Enzymatic Pathways", *J. Liq. Chromatogr. Relat. Technol*., **2019**, *42*, 184-193. DOI: 10.1080/10826076.2019.1587622

66. Piacentino, E.; Rodriguez, E.; Parker, K.; Gilbert, T. M; O'Hair, R. A. J. and Ryzhov, V. "Gas-phase functionalized carbon-carbon coupling reactions catalyzed by Ni(II) complexes", *J. Mass Spectrom*., **2019**, *54*, 520-526; DOI: 10.1002/jms.4360

67. Piacentino, E.; Parker, K.; Gilbert, T. M; O'Hair, R. A. J. and Ryzhov, V. "Role of ligand in the selective production of hydrogen from formic acid catalysed by the mononuclear cationic zinc complexes $[(L)Zn(H)]^+$ (L = tpy, phen, and bpy)." *Chem. Eur. J.,* **2019**, *25*, 9959-9966; DOI: 10.1002/chem.201901360