CURRICULUM VITAE

1. Personal Information and professional background

Name Igor A. Kaltashov

Affiliation Department of Chemistry, University of Massachusetts-Amherst

Current rank Professor

Educational background

1991-1995 Graduate School, University of Maryland Baltimore County. Ph.D., 1996 (Chemistry)

1989-1991 Post-graduate School, Moscow Institute of Physics and Technology

1983-1989 Department of Molecular and Chemical Physics, Moscow Institute of Physics and Technology, Diploma with Honors, 1989 (Chemical Physics)

Employment background

2011-present Professor, Chemistry Department, UMass-Amherst

2006-2011 Associate Professor, Chemistry Department, UMass-Amherst

2006 Gästprofessor, Uppsala Universitet, Uppsala Biomedicinska Centrum, Laboratoriet för Biologisk och Medicinsk Masspektrometri (Uppsala, Sweden)

2000-2005 Assistant Professor, Chemistry Department, UMass-Amherst

1997-2000 Lecturer, Polymer Science Department, UMass-Amherst

Director, Mass Spectrometry Center, UMass-Amherst

1995-1997 Post-Doctoral Fellow, Department of Pharmaceutical and Molecular Sciences, Johns Hopkins University School of Medicine (Baltimore, MD)

2. Awards and Professional Recognition

2025 Organizer and co-chair (with Aleksandra Nita-Lazar, NIH/NIAID), *ASMS Sanibel Conference on Mass Spectrometry in Immunology and Antibody Research*, Santa Fe, NM

2018 *Methods,* 2018, 144, 1-174, a thematic issue on Mass Spectrometry-based Methods to Study Macromolecular Higher Order Structure and Interactions

2017 Guest Editor (with Nickolau Beckmann and Albert D. Windhorst), *Frontiers in Pharmacology*, 2017, 7 (511), a focus issue on *in vivo* imaging in pharmacological research

2014-2016 Member-at-Large for Education, American Society for Mass Spectrometry

2013-present Editorial Advisory Board member, *Protein Science*

2013 BioProcess Development Lectureship, Biogen IDEC (Cambridge, MA)

2013 Guest Editor (with Nickolau Beckmann), *Advanced Drug Delivery Reviews*, 2013, 65 (8), a focus issue on delivery of biopharmaceuticals: analytical & biophysical methods

2012 Guest Editor (with Richard van Breemen), *International Journal of Mass Spectrometry*, 2012, 312 (SI), an issue honoring contribution of Prof. Catherine Fenselau to the field of biological mass spectrometry

2008 M.L. Gross Award and Lectureship in Mass Spectrometry, University of Nebraska

2006 Guest Editor (with John Engen), *Journal of the American Society for Mass Spectrometry*, 2006, *17* (11), a Focus issue on using hydrogen exchange and covalent labeling techniques to study biomolecular structure, dynamics and function

2006 Organizer and co-chair (with John Engen), *18-th Sanibel Conference on Mass Spectrometry "Hydrogen exchange and covalent modifications: focus on biomolecular structure, dynamics and function,"* Sanibel Island, FL

2001 Research Innovation Award, Research Corporation (Tucson, AZ)

2000 Young Investigator Award, American Society for Mass Spectrometry

3. Research, scholarly and creative activities

Grants and Contracts

***(i) active*:**

Development of Multi-dimensional Simultaneous Isotope Exchange, SIX^n - a Novel Probe of Structure and Dynamics of Soluble Metal Oxide Nanostructures and Solid Surfaces (CHE- 2404033)

Source: National Science Foundation
Amount awarded: **$ 480,000** (total costs)
Time period: 08/01/2024 - 07/31/2027

Novel metabolomic contrast probes for human lung cancer characterization (R01 CA273010, a subcontract from Harvard Medical School/Massachusetts General Hospital)

Source: NIH/NCI
Amount awarded: **$ 807,515** (total costs for UMass)
Time period: 09/01/2022 – 08/31/2027

Beyond the Active Site: Structure Informed Novel Regulatory Mechanism (R01GM121718 – a sub-contract from the University of Wisconsin School of Pharmacy)

Source: NIH/NIGMS
Amount awarded: **$ 183,694** (total costs for UMass)
Time period: 09/01/2023 – 08/31/2027

An integrated mass spectrometry approach to study heparin structure-bioactivity (R01 GM112666)

Source: NIH/NIGMS
Amount awarded: **$ 1,663,205** (total costs)
Time period: 02/01/2021-11/30/2024

***(ii) completed* in the past three years**

Cross-path reactive chromatography/mass spectrometry as a versatile platform for characterization of primary and higher order structure of complex heterogeneous proteins (R01 GM132673)

Source: NIH/NIGMS
Amount awarded: **$ 1,239,640** (total costs)
Time period: 03/01/2019 – 02/29/2024

Novel methods to study metastable biomolecular systems with native LC/MS (CHE-1709552)

Source: National Science Foundation
Amount awarded: **$ 420,000** (total costs)
Time period: 07/01/2017 - 05/31/2021

An integrated mass spectrometry approach to study heparin structure-bioactivity (R01 GM112666)

Source: NIH/NIGMS
Amount awarded: **$ 1,246,778** (total costs)

Time period: 04/01/2016 – 03/31/2021

Selected Publications (h-index 50; total number of citations >7,500[1])

(i) books authored:

3. I.A. Kaltashov, S. Wang and G. Wang. *Mass Spectrometry in the Analysis of Biopharmaceuticals: state-of-the-art and emerging trends*. Berlin: De Gruyter, **2021** (**ISBN** 978-3-11-054496-1)
2. I.A. Kaltashov, S.J. Eyles. *Mass Spectrometry in Structural Biology and Biophysics: Architecture,Dynamics and Interaction of Biomolecules*, *2nd edition*. New York: John Wiley & Sons, Inc., **2012** (**ISBN** 978-0-470-93779-2)
1. I.A. Kaltashov, S.J. Eyles. *Mass Spectrometry in Biophysics*. New York: John Wiley & Sons, Inc., **2005** (**ISBN** 0-471-45602-0)

(ii) chapters in books (from a total of 12):

10. I.A. Kaltashov✉ and C.E. Bobst. Mass spectrometry. In: *Molecular Biophysics for the Life Sciences*. N. Allewell, I. Rayment and L.O. Narhi, eds. Springer, **2013**, pp. 215-256 (**ISBN** 978-1-4614-8548-3)
4. I.A. Kaltashov.✉ Biopolymer ions in a solvent-free environment. In: *Encyclopedia of Mass Spectrometry, Vol. 8: Molecular Ionization*. M. L. Gross, ed. San Diego, CA: Elsevier, **2006**, pp. 735-746 (**ISBN** 0080438016)

(iii) articles in refereed journals (from a total of 145; articles cited >100 times are highlighted):

145. Y. Yang, Y. Du, D.G. Ivanov, C. Niu, R. Clare, J.E. Smith, I. Nazy & I.A. Kaltashov.✉ Molecular architecture and platelet-activating properties of small immune complexes assembled on heparin and platelet factor 4. *Comm. Biol*. **2024**, *7*, 308

144. Y. Yang, D.G. Ivanov, M.D. Levin, B.Z. Olenyuk, O. Cordova-Robles, B. Cederstrom, J.E. Schnitzer & I.A. Kaltashov.✉ Characterization of large immune complexes with size exclusion chromatography and native mass spectrometry supplemented with gas phase ion chemistry. *Anal. Chem*. **2024**, *96*, 2822-2829

142. D. G. Ivanov, N. Ivetic, Y. Du, S.N. Nguyen, S.H. Le, D. Favre, I. Nazy, and I.A. Kaltashov.✉ Reverse Engineering of a Pathogenic Antibody Reveals the Molecular Mechanism of Vaccine-Induced Immune Thrombotic Thrombocytopenia. *J. Am. Chem. Soc*. **2023**, *145*, 25203- 25213

134. D. Favre, C.E. Bobst, S.J. Eyles, H. Murakami, D.C. Crans and I.A. Kaltashov.✉ Solution- and gas-phase behavior of decavanadate: implications for mass spectrometric analysis of redox-active polyoxidometalates. *Inorg. Chem. Front.* **2022**, *9*, 1556-1564

131. Y. Yang, C. Niu, C.E. Bobst and I.A. Kaltashov.✉ Charge manipulation using solution and gas-phase chemistry to facilitate analysis of highly heterogeneous protein complexes in native mass spectrometry. *Anal. Chem.* **2021**, *93*, 3337–3342

127. Y. Yang, Y. Du and I.A. Kaltashov.✉ The utility of native MS for understanding the mechanism of action of repurposed therapeutics in COVID-19: heparin as a disruptor of the SARS-CoV-2 interaction with its host cell receptor. *Anal. Chem.* **2020**, *92*, 10930-10934

121. C. Ren, C.E. Bobst & I.A. Kaltashov.✉ Exploiting His-tags for absolute quantitation of exogenous recombinant proteins in biological matrices: ruthenium as a protein tracer, *Anal. Chem.* **2019**, *91*, 7189-7198

120. G.R. Masson, J.E. Burke, N.G. Ahn, G.S. Anand, C. Borchers, S. Brier, G.M. Bou-Assaf, J.R. Engen, S.W. Englander, J. Faber, R. Garlish, P.R. Griffin, M.L. Gross, M. Guttman, Y. Hamuro, A.J.R. Heck, D. Houde, R.E. Iacob, T.J.D. Jørgensen, I.A. Kaltashov, …, K.D. Rand.✉ Recommendations for

[1] source: Google Scholar (https://scholar.google.com/citations?hl=en&user=zaggq_QAAAAJ&view_op=list_works)

performing, interpreting and reporting hydrogen deuterium exchange mass spectrometry (HDX-MS) experiments. *Nat. Methods*. **2019**, *16*, 595-602

119. S.S. Dinges, A. Hohm, L.A. Vandergrift, J. Nowak, P. Habbel, I.A. Kaltashov,✉ L.L. Cheng.✉ Cancer metabolomic markers in urine: evidence, techniques and recommendations. *Nat. Rev. Urol.* **2019**, *16*, 339-362

116. J.W. Pawlowski, I. Carrick and I.A. Kaltashov.✉ Integration of on-column chemical reactions in protein characterization by LC/MS: Cross-path reactive chromatography. *Anal. Chem*., **2018**, *90*, 1348-1355

106. K. Muneeruddin, C.E. Bobst, R. Frenkel, D. Houde, I. Turyan, Z. Sosic and I.A. Kaltashov.✉ Characterization of a PEGylated protein therapeutic by ion exchange chromatography with on-line detection by native ESI MS and MS/MS. *Analyst* **2017**, 142, 336

102. Y. Zhao, R.R. Abzalimov, and I.A. Kaltashov.✉ Interactions of intact unfractionated heparin with its client proteins can be probed directly using native electrospray ionization mass spectrometry. *Anal. Chem*. **2016**, 88, 1711-1718

100. K. Muneeruddin, M. Nazzaro and I.A. Kaltashov.✉ Characterization of intact protein conjugates and biopharmaceuticals using ion-exchange chromatography with online detection by native electrospray ionization mass spectrometry and top-down tandem mass spectrometry. *Anal. Chem.* **2015**, *87*, 10138-10145

97. K. Muneeruddin, J.J. Thomas, P.A. Salinas and I.A. Kaltashov.✉ Characterization of small protein aggregates and oligomers using size exclusion chromatography with on-line detection by native electrospray ionization mass spectrometry. *Anal. Chem*. **2014**, *86*, 10692-10699

94. G. Wang, R.R. Abzalimov, C.E. Bobst, and I.A. Kaltashov.✉ Conformer-specific characterization of non-native protein states with high spatial resolution using hydrogen exchange and top-down mass spectrometry. *Proc. Natl. Acad. Sci. U.S.A.* **2013**, *110*, 20087-20092

84. I.A. Kaltashov,✉ C.E. Bobst, R.R.Abzalimov, G. Wang, B. Baykal, S. Wang. Advances and challenges in analytical characterization of biotechnology products: Mass spectrometry-based approaches to study properties and behavior of protein therapeutics. *Biotechnol. Adv*., **2012**, *30*, 210-222

79. C.E. Bobst, S. Wang, W.-C. Shen, and I.A. Kaltashov.✉ Mass spectrometry study of a transferrin-based protein drug reveals the key role of protein aggregation for successful oral delivery. *Proc. Natl. Acad. Sci. U.S.A.* **2012**, *109*, 13544-13548

72. G. Wang, R.R. Abzalimov, I.A. Kaltashov.✉ Direct monitoring of heat-stressed biopolymers with temperature-controlled electrospray ionization mass spectrometry. *Anal. Chem*. **2011**, *83*, 2870-2876

68. R.R. Abzalimov and I.A. Kaltashov.✉ Electrospray ionization mass spectrometry of highly heterogeneous protein systems: protein ion charge state assignment via incomplete charge reduction. *Anal. Chem*., **2010**, *82*, 7523-7526

67. R. Leverence, A.B. Mason, I.A. Kaltashov,✉ Non-canonical interactions between serum transferrin and transferrin receptor evaluated with electrospray ionization mass spectrometry. *Proc. Natl. Acad. Sci. U.S.A.* **2010**, *107*, 8123-8128

64. A.K. Frimpong, R.R. Abzalimov, V. Uversky, I.A. Kaltashov.✉ Characterization of intrinsically disordered proteins with electrospray ionization mass spectrometry: conformational heterogeneity of α-synuclein. *Proteins*, **2010**, *78*, 714-722

63. R.R. Abzalimov, D.A. Kaplan, M.L. Easterling, I.A. Kaltashov.✉ Protein conformations can be probed in top-down HDX MS experiments utilizing electron transfer dissociation of protein ions without hydrogen scrambling. *J. Am. Soc. Mass Spectrom*. **2009**, *20*, 1514-1517

60. I.A. Kaltashov,✉ C.E. Bobst, R.R. Abzalimov. H/D exchange and mass spectrometry in the studies of protein conformation and dynamics: is there a need for a top-down approach? *Anal. Chem*. **2009**, *81*, 7892-7899

59. I.A. Kaltashov,✉ R.R. Abzalimov. Do ionic charges in ESI MS provide useful information on macromolecular structure? *J. Am. Soc. Mass Spectrom*., **2008**, *19*, 1239-1246

53. R.R. Abzalimov, P.L. Dubin, I.A. Kaltashov.✉ Glycosaminoglycans as naturally occurring combinatorial libraries: developing a mass spectrometry-based strategy for characterization of anti-thrombin interaction with low molecular weight heparin and heparin oligomers. *Anal. Chem*. **2007**, *79*, 6055-6063

44. I.A. Kaltashov,✉ M. Zhang, S.J. Eyles and R.R. Abzalimov. Investigation of structure, dynamics and function of metalloproteins with electrospray ionization mass spectrometry. *Anal. Bioanal. Chem.*, **2006**, *386*, 472-481

41. I.A. Kaltashov✉ and A. Mohimen. Estimates of protein surface areas in solution by electrospray ionization mass spectrometry. *Anal. Chem*., **2005**, *77*, 5370-5379

39. H. Xiao, J.K. Hoerner, S.J. Eyles, A. Dobo, E. Voigtman, A.I. Mel'čuk and I.A. Kaltashov.✉ Mapping protein energy landscapes with amide hydrogen exchange and mass spectrometry. I. A generalized model for a two-state protein and comparison with experiment. *Protein Sci*., **2005**, *14*, 543-557

37. J.K. Hoerner, H. Xiao, A. Dobo and I.A. Kaltashov.✉ Is there hydrogen scrambling in the gas phase? Energetic and structural determinants of proton mobility within protein ions. *J. Am. Chem. Soc*., **2004**, *126*, 7709-7717

35. W.P. Griffith and I.A. Kaltashov.✉ Highly asymmetric interactions between globin chains during hemoglobin assembly revealed by electrospray ionization mass spectrometry. *Biochemistry*, **2003**, *42*, 10024-10033

26. A. Dobo, I.A. Kaltashov.✉ Detection of multiple protein conformational ensembles in solution via deconvolution of charge state distributions in ESI MS. *Anal. Chem*., **2001**, *73*, 4763-4773

18. I.A. Kaltashov, V. Doroshenko, R.J. Cotter, K. Takayama, N. Qureshi.✉ Confirmation of the structure of lipid A derived from the lipopolysaccharide of *Rhodobacter sphaeroides* by a combination of MALDI, LSIMS, and tandem mass spectrometry. *Anal. Chem.* **1997**, *69*, 2317-2322

10. I.A. Kaltashov, C. Fenselau.✉ A direct comparison of "first" and "second" gas phase basicities of the octapeptide RPPGFSPF. *J. Am. Chem. Soc.*, **1995**, *117*, 9906-9910

1. I.A. Kaltashov, G.V. Karachevtsev,✉ A.Z. Marutkin. Positive ion reactions in SF_6/air mixture. *Khim. Vys. Energ. (Russian Химия Высоких Энергий)*, **1990**, *24*, 489-492; Engl. transl.: *High Energy Chem.*, **1990**, *24*, 422-425

(iv) patents

3. I. Nazy, N. Ivetic, D.G. Ivanov and I.A. Kaltashov. US provisional patent application: Anti-platelet factor 4 (PF4) antibody recombinant protein, methods of making and uses thereof; filed **May 26, 2023**

2. S.N. Nguyen, C.E. Bobst and I.A. Kaltashov. US 09950075: Compositions and methods for delivering agents to the central nervous system; filed **March 2014**, granted **April 2018**

1. I.A. Kaltashov, G. Wang and R.R. Abzalimov. US8766179 B2: Temperature-controlled electrospray ionization source and methods of use thereof; filed **January 2013**, granted **July 2014**