

Musahid Ahmed

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Research Interests

Nanoscale Chemical Imaging, Vacuum Ultraviolet Photoionization Dynamics, Aerosol and Combustion Chemistry, Nanoparticle Physics, Synchrotron Radiation and Chemical Applications, Biological and Environmental Mass Spectrometry.

Academic Qualifications

PhD Physical Chemistry, 1989, University of Cambridge, U.K.
Thesis Adviser: Dr. A.B. Callear

BSc (Hons) Chemistry, 1985. University of Delhi, India.

Experience

Principal Investigator. Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA, 2006-present

Technical Expert. International Atomic Energy Agency, September 2006

Staff Scientist. Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA, 2000-present

Scientist. Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA, 1995-2000

Post-doctoral Research Fellow. University of Manchester. UK 1993-1995; Max Planck Institute for Strömungsforschung, Göttingen, Germany. 1991-1993; University of Leicester UK and British Petroleum, Sunbury, UK. 1989-1991

Awards and Funding:

Visualizing Functional Surfaces with Molecular Nano-imaging, DOE grant, 2006

The Camille and Henry Dreyfus Foundation Grant for Environmental Chemistry, 2005

Laboratory Directed Research Funding, Lawrence Berkeley National Laboratory, 2003-2006

Outstanding Performance Award, Lawrence Berkeley National Laboratory, 2003

Overseas Research Scholarship, Cambridge University, U.K. 1986-1988

Professional Membership:

American Chemical Society, American Physical Society, American Association for the Advancement of Science.

Publications of Musahid Ahmed

72. O. Kostko and M. Ahmed, *"Ionization energies of Small Si Clusters: Tunable VUV Experiments and Theory."* (In preparation)
71. O. Kostko, M. Ahmed, A. Mebel, and R. I. Kaiser, *"A Combined Experimental and Computational Study of the Ionization Energies of Cyclic and Linear C₄H₃ Isomers"* (In preparation)
70. A. I. Krylov, K. Bravaya, O. Kostko, and M. Ahmed, *"Electronic structure of the building blocks of life: H-bonding, π stacking, electrostatics in the VUV photoionization of DNA base pairs"* (In preparation)
69. O. Kostko, K. Bravaya, A. I. Krylov, and M. Ahmed, *"An experimental and theoretical study of the photoionization of cytosine and cytosine dimer: thermodynamic and ionization energy determinations"* (In preparation)
68. K. Bravaya, O. Kostko, M. Ahmed, and A. I. Krylov, *"An experimental and theoretical study of the photoionization of nucleobases: adenine, thymine, guanine, and cytosine"* (In preparation)
67. K. Bravaya, O. Kostko, M. Ahmed, and A. I. Krylov, *"The effect of clustering on the ionization energies of nucleobases: Adenine-adenine, thymine-thymine and adenine-thymine dimers"* (In preparation)
65. D.L. Che, J. D. Smith, S. R. Leone, M. Ahmed and K. R. Wilson, *"Quantifying the Reactive Uptake of OH by Organic Aerosols in a Continuous Flow Stirred Tank Reactor"* (In press)
64. S. Chakraborty, M. Ahmed, T. L. Jackson and M. H. Thiemens. *"Response to the Comment on "Experimental Test of Self-shielding in Vacuum Ultraviolet Photodissociation of CO" Science* (In press)
63. O. Kostko, S.K. Kim, S.R. Leone, and M. Ahmed, *"Mass-Analyzed Threshold Ionization (MATI) Spectroscopy of Atoms and Molecules using VUV Synchrotron Radiation"* (In press)
62. J. Zhou, O. Kostko, C. Nicolas, X. Tang, L. Belau, M. S. de Vries, and M. Ahmed, *"The direct observation of guanine tautomers using VUV photoionization"* J. Phys. Chem. A **113**, (2009) 4829
61. J. D. Smith, J. H. Kroll, C. D. Cappa, D. L. Che, M. Ahmed, S. R. Leone, D. R. Worsnop, and K. R. Wilson. *"The heterogeneous reaction of hydroxyl radicals with sub-micron squalane particles: a model system for understanding the oxidative aging of ambient aerosols"* Atmos. Chem. Phys. Discuss., **9**, 3945-3981, 2009
60. L. Takahashi, J. Zhou, K. R. Wilson, S. R. Leone and M. Ahmed, *"Imaging with Mass Spectrometry: A Secondary Ion and VUV-Photoionization Study of Ion-Sputtered Atoms and Clusters from GaAs and Au"* J. Phys. Chem. A **113**, (2009) 4035
59. O. Kostko, M. Ahmed, and R. B. Metz, *"A VUV photoionization measurement and ab-initio calculation of the ionization energy of gas phase SiO₂"* J. Phys. Chem. A **113**, (2009) 1225
58. D. L. Osborn, P. Zou, H. Johnsen, C. C. Hayden, C. A. Taatjes, V. D. Knyazev, S. W. North, D. S. Peterka, M. Ahmed, and S. R. Leone. *"The multiplexed chemical kinetic photoionization mass spectrometer: a new approach to isomer-resolved chemical kinetics."* Rev. Sci. Instrum. **79**, (2008) 104103

57. M. Citir, R.B. Metz, L. Belau, and M. Ahmed. "Direct determination of the ionization energies of PtC, PtO and PTO₂ with VUV radiation" J. Phys. Chem. A **112**, (2008) 9584
56. O. Kostko, L. Belau, K.R. Wilson and M. Ahmed. "Vacuum-ultraviolet (VUV) photoionization of small methanol and methanol-water clusters" J. Phys Chem. A **112**, (2008) 9555
55. S. Chakraborty, M. Ahmed, T. L. Jackson and M. H. Thiemens. "Experimental Test of Isotopic Self-Shielding in VUV photodissociation of CO" Science **321**, (2008) 1328
54. L. Belau, K. R. Wilson, S. R. Leone, and M. Ahmed. "Vacuum Ultraviolet (VUV) photoionization of small water clusters." J. Phys. Chem. A **111** (2007) 10075
53. L. Belau, S.E. Wheeler, B.W. Ticknor, M. Ahmed, S.R. Leone, W.D. Allen, H.F. Schaefer III, M.A. Duncan. "Ionization Thresholds of Small Carbon Clusters: Tunable VUV Experiments and Theory." J. Am. Chem. Soc. **129** (2007) 10229
52. K. R. Wilson, S. Zou, J. Shu, E. Rühl, S. R. Leone, G. C. Schatz and M. Ahmed. "Size-Dependent Angular Distributions of Low Energy Photoelectrons emitted from NaCl Nanoparticles." Nano Lett. **7** (2007) 2014
51. L. Belau, K. R. Wilson, S. R. Leone, and M. Ahmed. "Vacuum-Ultraviolet photoionization studies of the micro-hydration of DNA bases (Guanine, Cytosine, Adenine and Thymine)" J. Phys. Chem. A **111** (2007) 7562
50. R. I. Kaiser, L. Belau, S. R. Leone, M. Ahmed, Y. Wang, B. J. Braams, and J. M. Bowman. "A Combined Experimental and Computational Study on the Ionization Energies of the Cyclic and Linear C₃H Isomer" ChemPhysChem **8** (2007) 1236
49. M. Ahmed. "Photoionization of neutrals desorbed from surfaces". Encyclopedia of Mass Spectrometry, Volume 6, Elsevier (2007)
48. G. Meloni, P. Zou, S. J. Klippenstein, M. Ahmed, S. R. Leone, C. A. Taatjes, and D. L. Osborn. "Energy-resolved photoionization of alkyl peroxy radicals and the stability of their cations" J. Am. Chem. Soc. **128** (2006) 13567
47. E. F. Gloaguen, E. R. Mysak, S. R. Leone, M. Ahmed and K. R. Wilson. "Investigating the chemical composition of mixed organic-inorganic particles by "soft" VUV photoionization: the reaction of ozone with anthracene on sodium chloride particles." Int. J. Mass. Spectrom. **258** (2006) 74
46. J. Plenge, C. Nicolas, A. Caster, M. Ahmed, and S. R. Leone. "Two-color vacuum ultraviolet/visible photoelectron imaging dynamics of Br₂." J. Chem. Phys. **125** (2006) 133315
45. J. Shu, K. R. Wilson, M. Ahmed, and S. R. Leone. "Coupling a versatile aerosol apparatus to a synchrotron: vacuum ultraviolet light scattering, photoelectron imaging, and chemistry of fine particles." Rev. Sci. Inst. **77** (2006) 043106
44. K. R. Wilson, D. S. Peterka, M. Jimenez-Cruz, S.R. Leone, and M. Ahmed. "VUV photoelectron imaging of biological nanoparticles: Ionization energy determination of nanophase glycine and phenylalanine-glycine-glycine." Phys. Chem. Chem. Phys. **8** (2006) 1884

43. K. R. Wilson, L. Belau, M. Jimenez-Cruz, C. Nicolas, S. R. Leone, and M. Ahmed. "Direct determination of the ionization energy of histidine with VUV synchrotron radiation". *Int. J. Mass Spectrom.* **249-250**, (2006) 511
42. T. Zhang, X. N. Tang, C.Y. Ng, C. Nicolas, D. S. Peterka, M. Ahmed, M. L. Morton, B. Ruscic, R. Yang, L. X. Wei, C. Q. Huang, B. Yang, J. Wang, X. B. Shan, L. S. Sheng, and F. Qi. "Direct identification of propargyl radical in combustion flames by VUV photoionization mass spectrometry". *J. Chem. Phys.* **124** (2006) 074302
41. C. Nicolas, J. Shu, D. S. Peterka, M. Hochlaf, L. Poisson, S. R. Leone, and M. Ahmed. "Vacuum ultraviolet photoionization of C_3 ". *J. Am. Chem. Soc.* **128** (2006) 220
40. J. Shu, K. R. Wilson, M. Ahmed, S. R. Leone, C. Graf, and E. Ruhl. "Elastic light scattering from free nanoparticles in the vacuum-ultraviolet regime." *J. Chem. Phys.* **124** (2006) 34707
39. K. R. Wilson, M. Jimenez-Cruz, C. Nicolas, L. Belau, S. R. Leone, and M. Ahmed. "Thermal Vaporization of Biological Nanoparticles: Fragment-Free VUV Photoionization Mass Spectra of Tryptophan, Phenylalanine-Glycine-Glycine and β -carotene," *J. Phys. Chem. A.* **110** (2006) 2106
38. T.A. Cool, A. McIlroy, F. Qi, P.R. Westmoreland, L. Poisson, D.S. Peterka, and M. Ahmed. "A photoionization mass spectrometer for studies of flame chemistry with a synchrotron light source" *Rev. Sci. Instr.* **76** (2005) 94102
37. R. B. Metz, C. Nicolas, M. Ahmed, and S. R. Leone. "Direct determination of ionization energies of FeO and CuO with vacuum ultraviolet radiation." *J. Chem. Phys.* **123** (2005) 114313
36. E. R. Mysak, K. R. Wilson, M Jimenez-Cruz, M. Ahmed, and T. Baer. "Synchrotron radiation based aerosol time-of-flight mass spectrometry for organic constituents". *Anal. Chem.* **77** (2005) 5953
35. J. Shu, K. R. Wilson, A. N. Arrowsmith, M. Ahmed and S. R. Leone. "Light scattering of ultrafine silica particles by VUV synchrotron radiation" *Nano Lett.* **5** (2005) 109
34. D. S. Peterka and M. Ahmed. "Atoms to Aerosols- the chemical dynamics beamline". *Synchrotron Radiation News.* **18** (2005) 35
33. F. Davis, J. Shu, D.S. Peterka, and M. Ahmed. "A crossed beams study of the reaction: $^1CH_2 + C_2H_2 \rightarrow C_3H_3 + H$ " *J. Chem. Phys.* **121** (2004) 2546
32. J. Shu, D.S. Peterka, S. R. Leone, and M. Ahmed. "Tunable synchrotron vacuum ultraviolet ionization, time-of-flight investigation of the photodissociation of trans-crotonaldehyde at 193 nm" *J. Phys. Chem, A* **108** (2004) 7895
31. W. Li, L. Poisson, D.S. Peterka, M. Ahmed, R.R. Lucchese, A.G. Suits. "Dissociative photoionization dynamics in ethane studied by velocity map imaging" *Chem. Phys. Lett.* **374** (2003) 334
30. D.S.Peterka, A. Lindinger, L. Poisson, M. Ahmed, and D.N. Neumark. "Photoelectron imaging of helium droplets" *Phys. Rev. Lett.* **91** (2003) 43401

29. T.A. Cool, T.A. Mostefaoui, F. Qi, A. McIlroy, P.R. Westmoreland, M.E. Law, L. Poisson, D.S. Peterka, and M. Ahmed. "Selective detection of isomers with photoionization mass spectrometry for studies of hydrocarbon flame chemistry" *J. Chem. Phys.* **119**, (2003) 8356
28. X. Qian, A. H.Kung, T. Zhang, C.Y. Ng, and M. Ahmed. "Two-color photoionization spectroscopy using vacuum ultraviolet synchrotron radiation and infrared optical parametric oscillator laser." *Rev. Sci. Instrum.* **74** (2003) 2784
27. F. Qi, L. Sheng, M. Ahmed, D. S. Peterka and T. Baer. "Exclusive production of excited-state sulfur (1D) atoms from 193 nm photolysis of thietane", *Chem. Phys.Lett.* **357** (2002) 204
26. E.R. Wouters, M. Ahmed, D.S. Peterka, A.S. Bracker, A.G. Suits and O.S. Vasutinskii."Imaging the atomic orientation and alignment in photodissociation." *Imaging in Chemical Dynamics*, A.G. Suits and R. E. Continetti, eds., ACS Symposium Series 770, American Chemical Society, Washington DC, pp 238
25. M. Ahmed, D.S. Peterka, and A.G. Suits. "New directions in reaction dynamics using velocity map imaging." *Imaging in Chemical Dynamics*, A.G. Suits and R.E. Continetti, eds., ACS Symposium Series 770, American Chemical Society, Washington DC, pp 167
24. M. Ahmed, D.S. Peterka, and A.G. Suits. "Photodissociation of NO_2 near 225 nm by Velocity Map Imaging." *Atomic and Molecular Beams – The State of the Art 2000*. ed. R Campargue, Springer –Verlag Berlin Heidelberg 2001, pp 343
23. M Ahmed, D S. Peterka, P Regan, X Liu and A. G. Suits. "Ion Pair Imaging Spectroscopy: $\text{CH}_3\text{Cl} \rightarrow \text{CH}_3^+ + \text{Cl}^-$ " *Chem. Phys. Lett.* **339** (2001) 203
22. M. Ahmed, D. S. Peterka, and A. G. Suits. "Crossed Molecular Beam Reactive Scattering in Conjunction With Velocity Map Imaging and Single Photon Ionization" *Lambda Highlights*, No 56, (2000)
21. M. Ahmed, D.S. Peterka, and A.G. Suits. "Imaging H abstraction dynamics in crossed molecular beams: $\text{Cl} + \text{ROH}$ reactions" *Phys. Chem. Chem. Phys.* **2** (2000) 861
20. M. Ahmed, D.S. Peterka, and A.G. Suits. "H abstraction dynamics by crossed-beam velocity map imaging: $\text{Cl} + \text{CH}_3\text{OH} \rightarrow \text{CH}_2\text{OH} + \text{HCl}$." *Chem. Phys. Lett.* **317** (2000) 264
19. M. Ahmed, D.S. Peterka, and A.G. Suits. "The photodissociation of the vinyl radical (C_2H_3) at 243 nm studied by velocity map imaging." *J. Chem. Phys.* **110** (1999) 4248
18. M. Ahmed, D.S. Peterka and A.G. Suits. "Velocity map imaging of the $\text{O}(^1\text{D}) + \text{D}_2 \rightarrow \text{OD} + \text{D}$ reaction." *Chem. Phys. Lett.* **301** (1999) 372
17. D.S. Peterka, M. Ahmed, C.Y.Ng and A.G. Suits. "Dissociative photoionization dynamics of SF_6 by ion imaging with synchrotron undulator radiation." *Chem. Phys. Lett.* **312** (1999) 108
16. M. Ahmed, E.W. Wouters, D.S. Peterka, O.S. Vasutinski, and A.G. Suits. "Atomic orbital alignment and coherence in N_2O photodissociation at 193.3 nm." *Faraday Discuss.* **113** (1999) 425

15. D.S. Peterka, M. Ahmed, A.G. Suits, K.J. Wilson, A. Korkin, M. Noojen, and R.J. Bartlett. "Unravelling the mysteries of metastable O_4^* ." (vol 110, pg 6095, 1999)" J. Chem. Phys. **111** (1999) 5279
14. D.S. Peterka, M. Ahmed, A.G. Suits, K.J. Wilson, A. Korkin, M. Noojen, and R.J. Bartlett. "Unravelling the mysteries of metastable O_4^* ." J. Chem. Phys. **110** (1999) 6095
13. M. Ahmed, D.S. Peterka, A.S. Bracker, O.S. Vasyutinski, and A.G. Suits. "Coherence in polyatomic photodissociation: Aligned $O(^3P)$ from photodissociation of NO_2 at 212.8 nm." J. Chem. Phys. **110** (1999) 4115
12. W.M. Jackson, R.J. Price, D.D. Xu, J.D. Wrobel, M. Ahmed, D.S. Peterka and A.G. Suits. "Velocity map imaging studies of the Lyman $-\alpha$ photodissociation mechanism for H atom production from hydrocarbons." J. Chem. Phys. **109** (1998) 4703
11. H.M. Bevsek, M. Ahmed, D.S. Peterka, F.C. Sailes and A.G. Suits. "Direct detection and spectroscopy of O_4^* ." Faraday Discuss. **108** (1997) 131
10. M. Ahmed, C.J. Apps, M.J. Bramwell, J.L. Cooper, C. Hughes, K. Reinhardt, J.C. Whitehead, F. Winterbottom and A. Hopkirk. "Fluorescence excitation spectroscopy of some haloethenes, $CF_2=CXY$ ($XY \equiv FCl, Cl_2, FH$), excited in the vacuum ultraviolet (70-180 nm)." Chem. Phys. **219** (1997) 333
9. M. Ahmed, D. Blunt, D. Chen and A.G. Suits. "UV photodissociation of oxalyl chloride yields four fragments from one photon absorption." J. Chem. Phys. **106** (1997) 7617
8. M. Ahmed, C.J. Apps, R. Buensel, C. Hughes, N.E. Watt, I.H. Hillier and J.C. Whitehead. "Adsorption of N_xO_y -based molecules on large water clusters: An experimental and theoretical study." J. Phys. Chem. A **101** (1997) 1254
7. M. Ahmed, C.J. Apps, C. Hughes, N.E. Watt and J.C. Whitehead. "Adsorption of organic molecules on large water clusters." J. Phys. Chem. A **101** (1997) 1250
6. M. Ahmed, C.J. Apps, C. Hughes, and J.C. Whitehead. "The adsorption of methanol on large water clusters." Chem. Phys. Lett. **240** (1995) 216
5. M. Ahmed, P. Potzinger and H.Gg. Wagner. "Photolysis of tetramethylsilane near the absorption onset: Mechanism and Photophysics." J. Photochem. Photobiol. A-Chem. **86** (1995) 33
4. M. Ahmed, C.J. Apps, C. Hughes, and J.C. Whitehead. "Vacuum ultraviolet excitation of large water clusters." J. Phys. Chem. **98** (1994) 12530
3. M. Ahmed, I.M.T. Davidson, G.H. Morgan and T. Simpson. "Mechanism of pyrolysis of 2,2-Diethylhexamethyltrisilane." Organometallics. **10** (1991) 3772
2. M. Ahmed and A.B. Callear. "Mercury photosensitised excitation of SO_2 - Formation of triplet states in termolecular collisions." Chem. Phys. Lett. **157** (1989) 556
1. M. Ahmed and A.B. Callear. "Rate coefficients for reaction of $C_2H_2(a^3B_2)$." Chem. Phys. Lett. **156** (1989) 35

Invited talks and lectures (2005-2009)

Energy and Environmental science at a synchrotron;

Aerosol Chemistry, Nanoparticle Physics, Biomolecule energetics with VUV radiation;

Physical Chemistry Chemical Physics with Synchrotron Radiation,

Visualizing Chemistry and Biology with IR, VUV, and X-Ray photons; 4 lectures at the Joint ICTP/IAEA School on Novel Synchrotron Radiation Applications, Trieste, Italy, March 2009

Investigating atoms to aerosols with VUV Synchrotron Radiation ALS ESG/SSG seminar, LBNL, Berkeley, CA, November 2008

Energy and Environmental science at a synchrotron, workshop at ALS user meeting, Berkeley, CA, October 2008

Visualizing organic surfaces with imaging mass spectrometry, Visualizing Chemistry: Advances in Chemical Imaging, ACS National Meeting, Philadelphia, Aug 2008

Investigating Atoms to Aerosols with Vacuum Ultraviolet Radiation, DOE Imaging, Separations and Analysis Contractors meeting, Annapolis, Maryland, May 2008

Aerosol Chemistry, Nanoparticle Physics, and Imaging Mass Spectrometry with Vacuum Ultraviolet (VUV) Radiation, PIRE-ECCI Seminar series, UCSB, Santa Barbara, CA, Feb 2008

Physical Chemistry Chemical Physics with Synchrotron Radiation, SESAME users annual meeting, Amman, Jordan, Nov 2007

Aerosol Chemistry Nanoparticle Physics, Biomolecule Mass Spectrometry with VUV radiation, Institute of Eco-Environment, Beijing, China, July 2007

Aerosol Chemistry Nanoparticle Physics, Biomolecule Mass Spectrometry with VUV radiation, NSLS users meeting, Dalian, China, July 2007

Visualizing photoionization dynamics on nanoparticles with synchrotron radiation, 22nd International Symposium of Molecular Beams, Freiburg, Germany, May 2007

Probing aerosol chemistry and nanoparticle physics with vacuum-ultraviolet radiation, Chemistry Department seminar, Argonne National Labs, Argonne, IL, Feb. 2007

Probing Atoms to Aerosols with Synchrotron VUV radiation PITTCON, Chicago, IL, Feb. 2007

Investigating Atoms to Aerosols with Vacuum Ultraviolet Radiation, Condensed Phase, Interfaces and Molecular Sciences (CPIMS) DOE contractors meeting, Arlington, VA, Oct. 2006.

Past, present & future multicolor experiments at the ALS, Multicolor scientific opportunities at CIRCE and ALS workshop, ALS user meeting, Oct. 2006

Conducting State-of-the Art Chemical Physics at a Synchrotron, 2nd Jordanian workshop – SESAME in research, training and technological applications, Amman, Jordan, Sep 2006

Vacuum-Ultraviolet photoionization of fragile molecules, 10th Post-ionization Techniques in Surface Analysis workshop, Bommerholtz, Germany, Sep 2006

Photoionization studies of astrochemically relevant molecules, Astrochemistry - From Laboratory Studies to Astronomical Observations, Pacifichem, Hawaii, Dec 2005

Vacuum ultraviolet photoionization studies of biomolecules. Photophysical Dynamics in Biological Molecules Pacifichem, Hawaii, Dec 2005

Photoelectron imaging of nanoparticles. Frontiers in Structural and Functional Studies of Atomic and Molecular Clusters and Nano-particles, Pacifichem, Hawaii, Dec 2005

Single-Photon Ionization with Vacuum-Ultraviolet (VUV) Radiation, Chemistry department seminar, Penn State University, College Station, Oct 2005

VUV Interactions with Nanoparticles, Chemistry department seminar, University of Manchester, UK, Sep 2005

Photoelectron Imaging of Nanoparticles. 354. WE-Heraeus-Seminar "Structure and Dynamics of Free Clusters and Nanoparticles using Short Wavelength Radiation". Bad Honnef, Germany, Sep 2005

Interaction of nanoparticles with VUV light. Laboratoire de Chimie Physique, Université Paris Sud, Orsay, France, March 2005

Interaction of nanoparticles with VUV light. Laboratoire de Spectrometrie Ionique et Moleculaire, University of Lyon, France, March 2005

Interaction of nanoparticles with VUV light. Laboratoire Francis Perrin, CEA SACLAY, Orsay, France, March 2005

Interaction of nanoparticles with VUV light. Department of Chemistry, University of Hawaii, February 2005

Interaction of nanoparticles with VUV radiation. ALS SSG seminar series, LBNL, Berkeley, January 2005