

## Musahid Ahmed, Ph.D

MS 6R-2100, LBNL  
1 Cyclotron Road  
Berkeley, CA-94720

510-486-6355(PH)  
510-486-5311 (FAX)  
Mahmed@lbl.gov

### Research Interests

Imaging Mass Spectrometry, Electronic Structure of molecules, Vacuum Ultraviolet Photoionization Dynamics, Synchrotron Radiation and Chemical Applications.

### 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.

### Professional Experience

**Senior Scientist.** Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA, July 2010-present

**Acting Beamline Director.** Chemical Dynamics Beamline, Advanced Light Source, Lawrence Berkeley National Laboratory. Berkeley, CA, Jan-June 2009, Jan-June 2010.

**Visiting Scholar.** College of Chemistry, University of California, Berkeley, CA, Jan 2008-present.

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

**Technical Expert.** International Atomic Energy Agency, Vienna, Austria. September 2006

**Staff Scientist.** Chemical Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA, 2000-2010

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

**Post-doctoral Research Fellow.** University of Manchester. UK 1993-1995 (Prof. J. C. Whitehead);  
Max Planck Institute for Strömungsforschung, Göttingen, Germany. 1991-1993 (Prof. P. Potzinger);  
University of Leicester UK and British Petroleum, Sunbury, UK. 1989-1991 (Prof. I. M. T. Davidson)

### Awards and Grants

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 and activities**

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

Reviewer for the Journal of Physical Chemistry, Journal of the American Chemical Society, Journal of Chemical Physics, Journal of American Society of Mass Spectrometry, Rapid Communications in Mass Spectrometry, Chemical Physics, Chemical Physics Letters, Analytical Chemistry, Journal of Mass Spectrometry, Progress in Energy and Combustion Science, New Journal of Chemistry, Chemistry- an Asian Journal.

Discussion leader and Chair at Gordon Research Meetings and American Chemical Society Symposiums.

### **Member of committees**

Best Practices Diversity Council, Lawrence Berkeley National Laboratory (2001-2004)

Staff committee, Chemical Sciences Division, Lawrence Berkeley National Laboratory, (2010-present)

### **Scientific Collaborators (2008-present)**

Joel Bowman (Emory U), Kristie Boering (UC, Berkeley), Chris Cappa (UC. Davis), Romy Chakraborty (LBNL), Agnes Chang (National Dong Hwa U., Taiwan), John Daily (U Colorado, Boulder), Hugo Destailats (LBNL), Luke Hanley (U Illinois, Chicago), Mike Duncan (U Georgia, Athens), Barney Ellison (U Colorado, Boulder), Mattanjah De Vries (UC Santa Barbara), Ralf Kaiser (U Hawaii, Manoa), Kostas Kalogerakis (SRI), Marcus Kleber (U Oregon), Anna Krylov (USC), Stephen Klippenstein (ANL), Stephen Leone (LBNL, UC Berkeley), Alex Mebel (Florida International U), Ricardo Metz (U Mass, Amherst), Peter Nico (LBNL), Trent Northen (LBNL), Deirdre Olynick (LBNL), David Osborn (Sandia), Matt Shawkey (U Akron) Tom Slanger (SRI), Mohamed Sleiman (LBNL), John Stanton (U Texas, Austin), Craig Taatjes (Sandia), Mark Thiemens (UC San Diego), Kevin Wilson (LBNL), Doug Worsnop (Aerodyne).

### **Invited talks and lectures (2008-present)**

*(1) Probing molecular growth and thermal decomposition processes with a heated tubular reactor and tunable VUV radiation; (2) A Next Generation X-ray Laser Array at the Berkeley Lab.* International Workshop on Frontiers in Synchrotron Tools for Studies of Combustion and Energy, Shanghai, China, October 2011

*Spectroscopy, analysis, and imaging of molecules with synchrotron radiation and laser desorption,* Telluride Workshop "New Frontiers and Grand Challenges in Laser-based Biological Microscopy", Telluride, CO, August 2011

*Probing Kinetics with Synchrotron Radiation.* International Conference on Chemical Kinetics, Cambridge, MA, July 2011

*Spectroscopy, Analysis, and imaging of organic molecules with vacuum ultraviolet synchrotron radiation,* Seminar at Environmental and Molecular Sciences Laboratory, PNNL, Richland, May 2011

*Mass Spectrometry with VUV radiation,* First Annual Berkeley Metabolomics Symposium, LBNL, Berkeley, Jan. 2011

*Imaging mass spectrometry, cluster and biomolecule energetics with VUV radiation*, Chemical Society seminar, Cotton College, Guwahati, India, Dec 2010

*Imaging mass spectrometry, cluster and biomolecule energetics with VUV radiation*, Chemistry department seminar, Guwahati University, India, Dec 2010

*Imaging Mass Spectrometry, aerosol chemistry, cluster and biomolecule energetics with VUV radiation*. Topical Conference on Interaction of EM Radiation with Atoms, Molecules & Clusters (TC - 2010), RRCAT, Indore, India, March 2010

*Imaging Mass Spectrometry, aerosol chemistry, cluster and biomolecule energetics with VUV radiation*. National workshop on catalysis-2009, Catalysis for clean environment and sustainable future. Tezpur University, India, December 2009

*Imaging Mass Spectrometry, Aerosol Chemistry and Biomolecule Energetics with VUV Radiation*. Condensed Phase, Interfaces and Molecular Sciences (CPIMS) DOE contractors meeting, Arlington, VA, October 2009

*Investigating atoms to aerosols with Synchrotron Radiation*, Chemistry Dept. Seminar, University of the Pacific, Stockton, October 2009

*"WE LUV VUV" Investigating atoms to aerosols with Synchrotron Radiation*, Chemistry Dept. Seminar, University of Southern California, Los Angeles, August 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, Oct. 2008

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

## Publications

96. A.G. Vasiliou, K. M. Piech, B. Reed, X. Zhang, M. R. Nimlos, M. Ahmed, A. Golan, O. Kostko, D. L. Osborn, J. W. Daily, J. F. Stanton, and G. B. Ellison, "*Thermal Decomposition of CH<sub>3</sub>CHO Studied by Matrix Infrared Spectroscopy and Photoionization Mass Spectroscopy*". (submitted)
95. F. Zhang, R.I. Kaiser, A. Golan, M. Ahmed and N. Hansen, "*A VUV Photoionization Study of the Combustion-Relevant Reaction of the Phenyl Radical (C<sub>6</sub>H<sub>5</sub>) with Propylene (C<sub>3</sub>H<sub>6</sub>) in a High Temperature Chemical Reactor*" (submitted)
94. S. Chakraborty, R. Davis, M. Ahmed, T. L. Jackson, and M. H. Thiemens "*Oxygen isotope fractionation in vacuum ultraviolet photodissociation of carbon monoxide: Wavelength, pressure and temperature dependency*" (submitted)
93. A. Golan, K. B. Bravaya, R. Kudirka, O. Kostko, S. R. Leone, A. I. Krylov, and M. Ahmed. "*Ionization of stacked dimethyluracil dimers leads to facile proton transfer in the absence of H-bonds*". *Nature Chem.* (In press)
92. A. Golan and M. Ahmed, "*Ionization of water clusters mediated by exciton energy transfer from argon clusters*", *J. Phys. Chem. Lett.* (2012) **3**, 458
91. M. J. Berg, K. R. Wilson, C. Sorensen, A. Chakrabarti, and M. Ahmed, "*Discrete Dipole Approximation Model for Low-Energy Photoelectron Emission from NaCl Nanoparticles*" *J. Quant. Spectrosc. Radiat. Transfer* (2012) **113**, 259
90. D. Ghosh, A. Golan, L. Takahashi, A.I. Krylov and M. Ahmed "*An experimental and theoretical determination of the ionization energy of deoxyribose*", *J. Phys. Chem. Lett.* (2012) **3**, 97
89. O. Kostko, L. K. Takahashi, and M. Ahmed. "*Desorption Dynamics, Internal Energies and Imaging of Molecules from Surfaces with Laser Desorption and Vacuum Ultraviolet (VUV) Photoionization*", *Chem. Asian. J.* (2011) **6**, 3066
88. F. Zhang, R.I. Kaiser, V.V. Kislov, A.M. Mebel, A. Golan and M. Ahmed, "*A VUV Photoionization Study of the Formation of the Indene Molecule and Its Isomers*" *J. Phys. Chem. Lett.* (2011) **2**, 1031
87. A.G. Vasiliou, K. M. Piech, X. Zhang, M. R. Nimlos, M. Ahmed, A. Golan, O. Kostko, D. L. Osborn, J. W. Daily, J. F. Stanton, and G. B. Ellison, "*The Products of the Thermal Decomposition of CH<sub>3</sub>CHO*". *J. Chem. Phys.* (2011) **135**, 014306
86. M. T. Blaze, L.K. Takahashi, J. Zhou, M. Ahmed, F. D. Pleticha, and L. Hanley, "*Brominated Tyrosine and Polyelectrolyte Multilayer Analysis by Laser Desorption VUV Postionization and Secondary Ion Mass Spectrometry*". *Anal. Chem.* (2011) **83**, 4962
85. C.L. Liu, J. D. Smith, D. L. Che, M. Ahmed, S. R. Leone, and K. R. Wilson, "*The Direct Observation of Secondary Chemistry in the Heterogeneous Reaction of Chlorine Atoms with Submicron Squalane Droplets*" *Phys. Chem. Chem. Phys.* (2011) **13**, 8993

84. K. Khistyev, K. B. Bravaya, E. Kamarchik, O. Kostko, M. Ahmed, and A. I. Krylov, "The effect of microhydration on ionization energies of thymine" *Faraday Disc.* (2011) **150**, 313
83. G. L. Gasper, L. K. Takahashi, J. Zhou, M. Ahmed, J. F. Moore, and L. Hanley, "Comparing Vacuum and Extreme Ultraviolet Radiation for Postionization of Laser Desorbed Neutrals from Bacterial Biofilms and Organic Fullerene" *Nuclear Instruments and Methods in Physics Research Section A* (2011) **649**, 222
82. L.K. Takahashi, J. Zhou, O. Kostko, A. Golan, S. R. Leone and M. Ahmed, "VUV Photoionization and Mass Spectrometric Characterization of the Lignin Monomers Coniferyl and Sinapyl Alcohol" *J. Phys. Chem. A* (2011) **115**, 3279
81. P. Croteau, J. B. Randazzo, O. Kostko, M. Ahmed, M.C. Liang, Y. L. Yung and K. A. Boering, "Experimental determination of isotope effects in the non-dissociative photoionization of molecular nitrogen and implications for Titan's atmosphere" *Astrophys. J. Lett.* (2011) **728**, L32

**Electronic Structure of Biomolecules, Water Clusters, Cosmochemistry, Imaging Mass Spectrometry (2008-2010)**

80. K. B. Bravaya, O. Kostko, S. Dolgikh, A Landau, M. Ahmed, and A. I. Krylov "Electronic structure and spectroscopy of nucleic acid bases: Ionization energies, ionization-induced structural changes, and photoelectron spectra" *J. Phys. Chem. A* (2010) **114**, 12305
79. M. Sleiman, H. Destailats, J.D. Smith, Chen-Lin Liu, M. Ahmed, K. R. Wilson and L. A. Gundel, "Secondary organic aerosol formation from ozone-initiated reactions with nicotine and secondhand smoke" *Atmos. Environ.* (2010) **44**, 4191
78. R. I. Kaiser, P. Maksyutenko, C. Ennis, F. Zhang, X. Gu, A. Mebel, O. Kostko, M. Ahmed, "Untangling the Chemical Evolution of Titan's Atmosphere and Surface: From Homogeneous to Heterogeneous Chemistry" *Faraday Disc.* (2010) **147**, 429
77. K. R. Wilson, H. Bluhm, M. Ahmed, *Aerosol Photoemission*, in *Fundamentals and Applications in Aerosol Spectroscopy*, edited by J.P. Reid and R. Signorell, Taylor and Francis, (2010) pp 367-417
76. G. L. Gasper, L. K. Takahashi, J. Zhou, J. Moore, M. Ahmed, L. Hanley. "Laser Desorption Postionization Mass Spectrometry of Antibiotic-Treated Bacterial Biofilms using Tunable Vacuum Ultraviolet Radiation" *Anal. Chem.* (2010) **82**, 7472
75. R. I. Kaiser, B. J. Sun, H. M. Lin, A. H. H. Chang, A. Mebel, O. Kostko and M. Ahmed "An Experimental and Theoretical Study on the Ionization Energies of Polyynes ( $H-(C\equiv C)_n-H$ ;  $n = 1 - 9$ )" *Astrophys. J.* (2010) **719** 1884.
74. O. Kostko, J. Zhou, A. Chang, B. J. Sun, J. S. Lie, A. H. H. Chang, R. I. Kaiser and M. Ahmed "Determination of ionization energies of  $C_nN$  ( $n=3-12$ ) clusters: Vacuum-ultraviolet (VUV) photoionization experiments and theoretical calculations" *Astrophys. J.* (2010) **717**, 674
73. S. R. Leone, M. Ahmed and K. R. Wilson, "Chemical Dynamics, Molecular Energetics, and Kinetics at the Synchrotron" *Phys. Chem. Chem. Phys.*, (2010) **12**, 6564

72. E. Kamarchik, J. M. Bowman, O. Kostko, M. Ahmed, and A. I. Krylov, "Spectroscopic signatures of proton transfer dynamics in the water dimer cation". *J. Chem. Phys.* (2010) **132**, 194311
71. J. Zhou, L. Takahashi, K. R. Wilson, S. R. Leone and M. Ahmed, "Determination of Internal Energies of Ion Desorbed Neutral Organic Molecules with Tunable Vacuum Ultraviolet Photoionization" *Anal. Chem.* (2010) **82**, 3905
70. O. Kostko, K. Bravaya, A. I. Krylov, and M. Ahmed, "Ionization of cytosine monomer and dimer studied by VUV photoionization and electronic structure calculations." *Phys. Chem. Chem. Phys.*, (2010), **12**, 2860.
69. O. Kostko, S. R. Leone, M. A. Duncan and M. Ahmed, "Determination of ionization energies of small silicon clusters with vacuum-ultraviolet (VUV) photoionization." *J. Phys. Chem. A* (2010), **114**, 3176
68. K. Bravaya, O. Kostko, M. Ahmed, and A. I. Krylov, "The effect of pi-stacking, h-bonding, and electrostatic interactions on the ionization energies of nucleic acid bases: adenine-adenine, thymine-thymine and adenine-thymine dimers" *Phys. Chem. Chem. Phys.* **12**, (2010) 2261
67. D. Strasser, F. Goulay, L. Belau, O. Kostko, C. Koh, S. D. Chambreau, G. L. Vaghjiani, Z.H. Loh, M. Ahmed and S. R. Leone, "Tunable wavelength soft photoionization of ionic liquid vapors" *J. Phys. Chem. A* **114**, (2010) 879
66. R. I. Kaiser, A. Mebel, O. Kostko and M. Ahmed, "On the ionization energies of  $C_4H_3$  Isomers" *Chem. Phys. Lett.* **485**, (2010) 281
65. 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" *J. Phys. Chem. A* **113**, (2009) 14206
64. 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" *Phys. Chem. Chem. Phys.* **11** (2009) 7885
63. 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* **324**, (2009) 1516-d
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.* **9**, (2009) 3209
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  $SiO_2$ " *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 PTO<sub>2</sub> 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

**Ablation, Aerosol Chemistry, Nanoparticle Physics, Light Scattering, Flames, Helium Droplets (2003-2007)**

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 C<sub>3</sub>H 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 Br<sub>2</sub>." *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. Instr.* **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<sub>3</sub>". *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  $\beta$ -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:  $^1\text{CH}_2 + \text{C}_2\text{H}_2 \rightarrow \text{C}_3\text{H}_3 + \text{H}$ " *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

### Photodissociation, Photoionization, and Crossed Molecular Beams (1997-2002)

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. Vasyutinskii. "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:  $CH_3Cl \rightarrow CH_3^+ + Cl^-$ " 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:  $Cl + ROH$  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:  $Cl + CH_3OH \rightarrow CH_2OH + HCl$ ." 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  $O(^1D) + D_2 \rightarrow OD + D$  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
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