

DR. LAWRENCE G. PIPER

Journal Publications

1. Craig, N.C. Lo, G.Y.-S., Piper, L.G., and Wheeler, J.C., "Vibrational Assignments and Potential Constants for cis- and trans-1-Chloro-2 fluoroethylenes and their Deuterated Modifications," *J. Phys. Chem.* 74, 1712 (1970).
2. Craig, N.C., Evans, D.A., Piper, L.G., and Wheeler, V.L., "Vibrational Assignments and Thermodynamic Functions for cis- and trans-1, 2-Difluoro1-Chloroethylenes," *J. Phys. Chem.* 74, 4520 (1970).
3. Craig, N.C., Piper, L.G., and Wheeler, V.L., "Thermodynamics of cis-trans Isomerizations. II. The 1-Chloro-2-fluoroethylenes, 1, 2-Difluorocyclopropanes, and Related Molecules," *J. Phys. Chem.* 75, 1453 (1971).
4. Piper, L.G., Hellemans, L., Sloan, J., and Ross, J., "Total Cross-Section for Formation of Ions from CsBr by Collisions with Ar, Xe and NaBr (Ar)," *J. Chem. Phys.* 57, 4742 (1972).
5. Piper, L.G., Richardson, W.C., Taylor, G.W., and Setser, D.W., "Quenching Processes and Rate Constants for Interaction of Metastable Argon Atoms with Diatomic and Triatomic Molecules," *Discuss. Faraday Soc.* 53, 100 (1972).
6. Piper, L.G., Velazco, J.E., and Setser, D.W., "Quenching Cross-Sections for Electronic Energy Transfer Reactions Between Metastable Argon Atoms and Noble Gases and Small Molecules," *J. Chem. Phys.* 59, 3323 (1973).
7. Setser, D.W., Piper, L.G., and Velazco, J.E., "Quenching Rate Constants for the Ar (3P_0), Ar (3P_2) and Xe (3P_2) States," *Radiation Research* 59, 441 (1974).
8. Piper, L.G., "Electronic Energy Transfer Between Metastable Argon Atoms and Ground-State Oxygen Atoms," *Chem. Phys. Letters* 28, 276 (1974).
9. Piper, L.G., Gundel, L., Velazco, J.E., and Setser, D.W., "Excitation of Nitrogen and Carbon Monoxide Ionic Emissions by He (2^3S), He $^+$, and He $_2^+$," *J. Chem. Phys.* 62, 3883 (1975).
10. Piper, L.G., Setser, D.W., and Clyne, M.A.A., "Electronic Energy Transfer from Metastable Argon Atoms to Krypton Atoms," *J. Chem. Phys.* 63, 5018 (1975).
11. Clyne, M.A.A. and Piper, L.G., "Kinetic Spectroscopy in the Far Vacuum Oscillator Ultraviolet, Part 3. Oscillator Strengths for the 3s, 4s and 5s $^3S - 2p^4^3P_2$ Transitions in Atomic Oxygen," *JCS Faraday II* 72, 2178 (1976).
12. Marcoux, P.J., Piper, L.G., and Setser, D.W., "Infrared Radiative Decay Constants for the Vibrational Levels of CO (a^3)," *J. Chem. Phys.* 66, 351 (1977).
13. King, D.L., Piper, L.G., and Setser, D.W., "Electronic Energy Transfer from Metastable Argon ($4s^3P_{0,2}$) to Xenon, Oxygen and Chlorine Atoms," *JCS Faraday II* 73, 177 (1977).
14. Piper, L.G. "On the Excitation of the Krypton 123.6 nm Emission by Metastable Argon Atoms," *J. Chem. Phys.* 67, 1795 (1977).
15. Piper, L.G., "On the Heat of Formation of NH," *J. Chem. Phys.* 70, 3417 (1979).
16. Piper, L.G., Krech, R.H., and Taylor, R.L., "Generation of N $_3$ in the Thermal Decomposition of NaN $_3$," *J. Chem. Phys.* 71, 2099 (1979).
17. Piper, L.G., "Comment on 'Determination of the Rate Constants of the Reactions of N $_3$ and NCl Free Radicals Using a Simulation Technique'," *Combustion and Flame* 38, 213 (1980).

18. Piper, L.G., Krech, R.H., and Taylor, R.L., "The UV Photolysis of Hydrazoic Acid," *J. Chem. Phys.* 73, 791 (1980).
19. Piper, L.G., Clyne, M.A.A., and Monkhouse, P.B., "Electronic Energy Transfer from Metastable Argon Atoms to Nitrogen Atoms," *Chem. Phys.* 51, 107 (1980).
20. Piper, L.G., Caledonia, G.E., and Kennealy, J.P., "Rate Constants for Deactivation of $N_2(A^3\Sigma_u^+ v'=0,1)$ by O_2 ," *J. Chem. Phys.* 74, 2888 (1981).
21. Rawlins, W.T. and Piper, L.G., "Effect of Excitation Mechanism on Line-width Parameters of Conventional VUV Discharge Line Sources," *Proc. Soc. Photo. Opt. Instr. Eng.* 279, 58 (1981).
22. Piper, L.G., Wilemski, G., and Lewis, P.F., "Thermodynamic Properties of Gas Phase Potassium Sulfide," *High Temperature Science* 14, 1 (1981).
23. Piper, L.G., Caledonia, G.E., and Kennealy, J.P., "Rate Constants for Deactivation of $N_2(A^3\Sigma_u^+ v'=0,1)$ by O," *J. Chem. Phys.* 75, 2847 (1981).
24. Piper, L.G. and Clyne, M.A.A., "Determination of the Translational Energy of $O(3s^3S)$ Excited in the Dissociative Excitation of O_2 and NO by $He^*(2^3S)$ " *Chem. Phys.* 63, 77 (1981).
25. Berquist, B.M., Bozzelli, J.W., Dzelzkalns, L.S., Piper, L.G., and Kaufman, F., "Vibrational Relaxation of Highly Excited Diatomics I. Method, Analysis and Application to $HCl(v \leq 7) + CO_2$ and N_2O ," *J. Chem. Phys.* 76, 2972 (1982).
26. Piper, L.G., Krech, R.H., and Taylor, R.L., "The UV Photolysis of Chlorine Azide," *J. Photochem.* 18, 125 (1982).
27. Piper, L.G., "The Excitation of $O(^1S)$ in the Electronic Energy Transfer Between $N_2(A^3\Sigma_u^+)$ and O," *J. Chem. Phys.* 77, 2373 (1982).
28. Piper, L.G., Clyne, M.A.A., and Monkhouse, P.B., "Electronic Energy Transfer from $Ar^*(^3P_{2,0})$ to O," *JCS Faraday 2* 78, 1373 (1982).
29. Frish, M.B., Piper, L.G., and Wilemski, G., "Experimental and Theoretical Study of Condensation in Multicomponent Vapors," *Proc. 2nd Symp. Energy Engn. Sci.*, Argonne, IL (1984) (NTIS Conf. 8404123).
30. Piper, L.G., Green, B.D., Blumberg, W.A.M. and Wolnik, S.J., " N_2^+ Meinel Band Quenching," *J. Chem. Phys.* 82, 3139 (1985).
31. Marinelli, W.J. and Piper, L.G., "Franck-Condon Factors and Absolute Transition Probabilities for the $IF(B^3\Pi_{O^+}-X^1\Sigma^+)$ Transition," *J. Quant. Spectrosc. Radiat. Transfer* 34, 321 (1985).
32. Piper, L.G., Marinelli, W.J., Rawlins, W.T., and Green, B.D., "The Excitation of $IF(B^3\Pi_{O^+})$ by $N_2(A^3\Sigma_u^+)$," *J. Chem. Phys.* 83, 5602 (1985).
33. Piper, L.G. and Rawlins, W.T., "O-Atoms Yields from Microwave Discharges in N_2O/Ar Mixtures," *J. Phys. Chem.* 90, 320 (1986).
34. Piper, L.G., Green, B.D., Blumberg, W.A.M., and Wolnik, S.J., "Electron Impact Excitation of the N_2^+ Meinel Band," *J. Phys. B: Atom. Molec. Phys.* 19, 3327 (1986).
35. Piper, L.G., and Cowles, L.M., "Einstein Coefficients and Transition Moment Variation for the $NO(A^2\Sigma^+-X^2\Pi)$ Transition," *J. Chem. Phys.* 85, 2419 (1986).
36. Piper, L.G., Cowles, L.M., and Rawlins, W.T., "State-to-State Excitation of $NO(A^2\Sigma^+, v'=0,1,2)$ by $N_2(A^3\Sigma_u^+, v'=0,1,2)$," *J. Chem. Phys.* 85, 3369 (1986).
37. Piper, L.G., Donahue, M.E., and Rawlins, W.T., "Rate Coefficients for $N(^2D)$ Reactions," *J. Phys. Chem.* 91, 3883 (1987).

38. Piper, L.G., "Quenching Rate Coefficients for $N_2(a^1\Sigma_u^-)$," *J. Chem. Phys.* 87, 1625 (1987).
39. Piper, L.G., Spencer, M.N., Woodward, A.M., and Green, B.D., "CROSS: Contaminant Removal Off Optical Surfaces in Space," *Proc. Soc. Photo. Opt. Instr. Eng.* 777, 320 (1987).
40. Piper, L.G., "State-to-State $N_2(A^3\Sigma_u^+)$ Energy Pooling Reactions I. Formation of $N_2(C^3\Pi_u)$ and the Herman Infrared System," *J. Chem. Phys.* 88, 231 (1988).
41. Piper, L.G., "State-to-State $N_2(A^3\Sigma_u^+)$ Energy Pooling Reactions II. Formation and Quenching of $N_2(B^3\Pi_g)$," *J. Chem. Phys.* 88, 6911 (1988).
42. Piper, L.G. and Marinelli, W.J., "Determination of Non-Boltzmann Vibrational Distributions of $N_2(X,v)$ in He/ N_2 Microwave-Discharge Afterglows," *J. Chem. Phys.* 89, 2918 (1988).
43. Davis, S.J., Rawlins, W.T., and Piper, L.G., "The Rate Coefficient for the Reaction $H+NF(a^1\Delta)$," *J. Phys. Chem.* 93, 1078 (1989).
44. Fraser, M.E. and Piper, L.G., " N_2O , $O(^3P)$, and $O_2(B^3\Sigma_u^-)$ Product Branching Ratios from the $N_2(A^3\Sigma_u^+) + O_2$ Reaction," *J. Phys. Chem.* 93, 1107 (1989).
45. Piper, L.G., Holtzclaw, K.W., Green, B.D., and Blumberg, W.A.M., "Experimental Determination of the Einstein Coefficients for the $N_2(B-A)$ Transition," *J. Chem. Phys.* 90, 5337 (1989).
46. Piper, L.G., and Marinelli, J., "The Excitation of IF by Active Nitrogen," *J. Phys. Chem.* 93, 4033 (1989).
47. Piper, L.G., "The Excitation of $N(^2P)$ by $N_2(A^3\Sigma_u^+)$," *J. Chem. Phys.* 90, 7087 (1989).
48. Piper, L.G., "The Excitation of $N_2(B^3\Pi_g, v=1-12)$ in the Reaction Between $N_2(A^3\Sigma_u^+)$ and $N_2(X, v\geq 5)$," *J. Chem. Phys.* 91, 864 (1989).
49. Piper, L.G., "The Rate Coefficient for Quenching $N(^2D)$ by $O(^3P)$," *J. Chem. Phys.* 91, 3516 (1989).
50. Piper, L.G., "Comment on 'Discharge Emissions from NaN_3 Related to the HgBr Laser,'" *J. Quant. Spectrosc. Radiat. Transfer* 42, 649 (1989).
51. Davis, S.J. and Piper, L.G., "The Production of $N_2(B^3\Pi_g, v'=1-12)$ in the Reaction Between $NF(a^1\Delta)$ and $N(^2D)$," *J. Phys. Chem.* 94, 4515 (1990).
52. Cummings, W.P. and Piper, L.G., "Production of $N_2(A^3\Sigma_u^+)$ in the Low Pressure Dielectric-Barrier (Ozonizer) Discharge," *Appl. Spectrosc.* 44, 656 (1990).
53. Marinelli, William J., Kessler, William J., Piper, Lawrence G., and Rawlins, W. Terry, " H_2/O_2 Three-Body Rates at High Temperatures, AIAA Paper 90-1696 (1990).
54. Piper, L.G., Frish, M.B., Pierce, V.G., and Green, B.D., "Laser Cleaning of Cryogenic Optics," San Diego/SPIE - *Proc. Soc. Photo-Opt. Instr. Eng.* 1329, 110 (1990).
55. Pierce, V.G., Frish, M.B., Green, B.D., Piper, L.G., Guregian, J., and Anapol, M., "Laser-Mirror Cleaning in a Simulated Space Environment," *Proc. Soc. Photo-Opt. Instr. Eng.* 1329, 134 (1990).
56. Fraser, M.E., Tucker, T.R., Piper, L.G., and Rawlins, W.T., " N_2O Production Mechanism from the Interaction of Discharge-Excited Species," *J. Geophys. Res.* 95, 18,611 (1990).
57. Piper, L.G. and Caledonia, G.E., "Kinetics of Silane Decomposition by Atomic and Molecular Nitrogen Metastables," *J. Phys. Chem.* 95, 698 (1991).
58. Piper, L.G., "Further Observations on the Excitation of IF(B) in Active Nitrogen," *J. Phys. Chem.* 95, 3965 (1991).

59. Upschulte, B.L., Sonnenfroh, D.S., Piper, L.G., Green, B.D., and Cox, John, "Fast Oxygen Atom Collision with MMH: Excitation of UV, Visible Emission," Proc. of the 19th JANNAF Exhaust Plume Tech. Subcom. Mtg., Huntsville, AL, May 15, 1991.
60. Piper, L.G., Tucker, T.R., and Cummings, W.P., "Electronic Transition Moment Variation and Einstein Coefficients for the $\text{NO}(\text{B}^2\Pi-\text{X}^2\Pi)$ System," *J. Chem. Phys.* 94, 7667 (1991).
61. Piper, L.G., "Energy Transfer Studies on $\text{N}_2(\text{X}^1\Sigma_g^+, \nu)$ and $\text{N}_2(\text{B}^3\Pi_g)$," *J. Chem. Phys.* 97, 270 (1992).
62. Benfey, D.P., Brown, D.C., Davis, S.J., Piper, L.G., and Foutter, R.F., "Diode-Pumped Dye Laser Analysis and Design," *Applied Optics*, 31, 33 (1992).
63. Upschulte, B.L., Oakes, D., Piper, L.G., and Green, B.D., "UV-Visible Emissions Generated by Fast O, O^+ Collisions with Hydrocarbons and Nitrogen Oxides," Prepared for 20th JANNAF Exhaust Plume Technology Subcommittee Meeting, Phillips Laboratory, Kirtland AFB, NM, 9-11 February 1993.
64. Piper, Lawrence G., "The Reactions of $\text{N}(\text{P}^2)$ with O_2 and O," *J. Chem. Phys.* 98, 8560 (1993).
65. Piper, Lawrence G., "Re-evaluation of the Transition-Moment Function and Einstein Coefficients for the $\text{N}_2(\text{A}^3\Sigma_u^+ - \text{X}^1\Sigma_g^+)$ Transition," *J. Chem. Phys.* 99, 3174, (1993).
66. Davis, S.J., Holtzclaw, K.W., McManus, K.R., and Piper, L.G., "An Iodine Standard Lamp," *Metrologia* 30, 249 (1993).
67. Piper, Lawrence G., "Further Observations on the Nitrogen Orange Afterglow," *J. Chem. Phys.*, 101, 10229 (1994).
68. Piper, L.G., "Experimental Determination of the Ratio A_{00} and A_{01} for the Infrared Atmospheric Bands of Molecular Oxygen," *J. Geophys. Res.*, submitted (1991).
69. Piper, L.G., Du, H., Fraser, M.E., and Davis, S.J., "Portable Sensor for Hazardous Waste," Proc. Opportunity '95 - Environm. Tech. through Small Business, V.P. Kotheris, ed., pp. 229-244 (1995) - available through NTIS.
70. Piper, Lawrence G., "Observations on the O/NO Air Afterglow," *Chemical Physics*, submitted (1998).
71. Piper, Lawrence G., "Experimental Determination of the Einstein Coefficient for the $\text{N}(\text{P}^4\text{S})$ Transition," *Chem. Phys. Lett.* 296, 397-402 (1998).
72. Gittins, C.M., Piper, L.G., Rawlins, W.T., Marinelli, W.J., Jensen, J.O., and Akinyemi, A.N., "Passive and Active Infrared Stand-off Detection of Bio-Aerosols", *Field Analytical Chemistry and Technology*, 3, 274-282 (1999).
73. Hunter, A.J.R., Davis, S.J., Piper, L.G., Holtzclaw, K.W., and Fraser, M.E., "Spark-Induced Breakdown Spectroscopy (SIBS) - A New Technique for Monitoring Heavy Metals," *Appl. Spectr.* 54, 575 (2000).
74. Piper, L.G., "Energy Transfer Kinetics of $\text{N}_2(\text{X}^1\Sigma_u^+, \nu)$ and SiH_4 ," *J. Phys. Chem. A* 106, 8355 (2002).
75. Hunter, A.J.R., Wainner, R.T., Piper, L.G., and Davis, S.J., "Rapid Field Screening of SOILS for Heavy Metals with Spark-Induced Breakdown Spectroscopy (SIBS)," *Applied Optics* 42, 2102 (2003).
76. W.T. Rawlins, S. Lee, W.J. Kessler, D.B. Oakes, L.G. Piper, and S.J. Davis, "Spectroscopic Studies of a Prototype electrically Pumped COIL System", SPIE Paper No. 5334-12, SPIE Photonics West 2004.

77. Hunter, A.J.R. and Piper, L.G., "Spark-induced breakdown spectroscopy: a description of an electrically-generated LIBS-like process for elemental analysis of airborne particulates and solid samples," in Miziolek, Andrzej, Palleschi, Vincenzo and Schechter, Israel, eds. *Laser-Induced Breakdown Spectroscopy (LIBS): Fundamentals and Applications*, ch. 18, September, 2006.