

DR. JIMMIE CAROL OXLEY

Dr. Jimmie Carol Oxley is Professor of Chemistry at the University of Rhode Island (URI), co-Director of the Department of Homeland Security (DHS) Center of Excellence (CoE) in Explosive Detection, Mitigation, and Response, and co-Director of the Forensic Science Partnership of URI. She earned a Ph.D. from the University of British Columbia (Chemistry) and joined the faculty of New Mexico Institute of Mining & Technology (NMT) where she founded a Ph.D. program in explosives and created a Thermal Hazards Research group. Oxley's lab specializes in the study of energetic materials—explosives, propellants, pyrotechnics.

Dr. Oxley has organized numerous symposia and short courses for government and industrial laboratories on topics ranging from hazards analysis to bomb threats: Sandia and Los Alamos National Labs; NAVSEA, Indian Head; US Army R&D (WES); FAA Technical Center. Dr. Oxley is the past chair of the Gordon Research Conference (GRC) on Energetic Materials; co-founder of Life Cycles of Energetic Materials and the GRC on Illicit Substance Detection. She is an elected fellow of the North American Thermal Analysis Society and a reviewer for the FBI, NSF, and National Academy of Sciences (NAS) National Research Council (NRC). Dr. Oxley has served on five NRC panels--Military Science Board advising the Army on Chemical Weapon Destruction (1998-99); Chemistry Board advising ATF & Congress on the Committee on Marking, Rendering Inert, & Licensing of Explosive Material (1997-98); National Material Advisory Board (NMAB) advising the FAA on Commercial Aviation Security (1995-98); the Manufacturing Board's Advanced Energetic Materials (2001-2002); the Naval Studies Board's Determining Basic Research Needs to Interrupt the Improvised Explosive Device Delivery Chain.(2005-2008); the Army Research Lab's Armor and Armaments panel (2009-2011)

Dr. Oxley has authored 80 papers on energetic materials (explosives, propellants, pyrotechnics). She has worked on law enforcement issues [with the FBI simulating the World Trade Center bombing (1993), with FEL examining large fertilizer bombs, and with ATF studying the behavior of pipe bombs]; however, her main research interest is hazard analysis of energetic materials. Studies include kinetics, analysis and prediction of stability, safety issues, synthesis of energetics, and analytical protocols. Her study of ammonium nitrate stability and terrorist usage has led to two invitation to testify before a subcommittee of the House Homeland Security Committee. In addition, she has studied most classes of energetic materials with publications on nitrate esters (PETN, NG, NC); nitroarenes (TNT, TATB, DNT, and related ring systems); nitramines (RDX, HMX, CL-20); nitrogen-heterocycles (NTO, TNAZ); energetic salts (AN, AP, ADN, HAN); proto-type difluoroamine compounds; and other energetic compounds, such as hydroxylamine, hydrogen peroxide, TATP, and HMTD. Work has been performed for a variety of companies (BASF, Battelle, Dow Chemical, DuPont, Exxon, Honeywell) and government agencies (U.S. Army, Navy, Air Force, FAA, TSA, DARPA, and Sandia & Los Alamos National Labs). Dr. Oxley's URI laboratory is equipped with state-of-the-art analytical instruments: calorimeters, chromatographs, mass spectrometers and multinuclear NMR. Present projects include energetic chlorine-containing salts, TNT and RDX residue analysis, hypergolic reactions of TNT, characterization of pipe bombs, preparation of canine training aids and explosive detection evaluations.

DR. JIMMIE CAROL OXLEY

EDUCATION

Ph.D., Chemistry, University of British Columbia, Vancouver;

M.S., Chemistry, California State University, Northridge, CA;

B.A., University of California, San Diego, CA.

AWARDS & HONORS

Outstanding Research Award URI, May 2009

Invited witness, House Science & Technology Committee April 24, 2008

Saferstein Memorial Award Lecturer, Northwestern U. March 2005

Invited witness, House Subcommittee Homeland Security on HR3197, Dec. 14, 2005.

National Academy of Science (NAS): National Research Council (NRC)--6 committees:

Army's Armor & Armaments (2009-2011)

Navy Studies Board "Improvised Explosive Devices" (2005-2008)

Manufacturing Board-advising US military "Advanced Energetic Materials Manufacture"(01-02)

Military Science Board advising U.S Army--"Chemical Weapon Destruction" (Dec. 97-June 99).

Chemistry Board advising ATF&Congress"Marking, Rendering Inert, & Licensing Explosives(96-'98)

National Material Advisory Board advising FAA-- "Commercial Aviation Security" (Jan'95-98).

Organizer & Chair in nat'l organizations (Gordon Research Conf. Energetic Materials 1994,96;

Calorimetry Conf. 1991-94; Life-Cycles Energetic Materials 1993-98; NATAS 1992-96)

Elected Fellow North American Thermal Analysis Society (NATAS); Sept. 1995.

Vice-Chair of NMIMT Faculty Senate (1993-94)

Chair of New Mexico section of the American Chemical Society '88; education chair '85

NMIMT corporate representative to American Assoc. of University Women '93-85

Reviewer for the FBI, National Science Foundation (NSF), National Academy of Sciences

(NAS) Naval Studies Board & National Research Council (NRC) & Department of Energy

DOE review panel: "Low-Level Mixed Waste Cleanup"; June 1993, Feb. 1994, Ap 1994.

"Recycle, Reuse, & Disposal of Materials DOE's Decontam. & Decommis. Act.;" Oct. '92.

Interviewed: *Chemistry & Engineering News*, article-July 5, '93, p5; ACS journal; *New York Times* (7/25,8/7, 9/5,); *Business Week* (8/12.); Expert Moderator for 10 Explosives 2001

Videotaped interview for national ACS TV news brief, Nov. 23, 1993 (aired Dec. '93).

Good Morning America July 31, 96; Nat. Public Radio, Aug. 26, '96; CNN ,ABC Discover,

Nov.17 1996. Newsmakers (Aug.4 96), Truman Taylor Show (Aug. 11'96), TV Ashia, TV Nippon

(Aug. 1996); CBS 48 Hours Jan. 16, 1997; Script reviewer GRB Entertainment October 1997.

Featured in Rhode Island Monthly, Sept, 2000 and in Providence Journal, May, 2000

Quoted-New York Times, Boston Globe, Baltimore Sun & appeared on ABC Nightline Aug. 11,

06. Listed *Who's Who in Science & Engineering* '92, '93; *Who's Who Among America's Teacher's* '94.

PERSONAL DATA

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PUBLICATIONS

IN PRESS

Oxley, J.C.; Smith, J.L.; Bernier, E.T.; Sandstrom, F.W.; Weiss, G.G; Recht, G.W.; Schatzer, D.S.
"Characterizing the Performance of Pipe Bombs" in prep.

Oxley, J.C.; Smith, J.L.; Kirschenbaum, L.; Marimiganti, S.; Efremenko, I.; Zach, R; Zeiri, Y

Accumulation of Explosive in Hair: Part 3: Binding Site Study submitted to Langmir.

Oxley, J.C., Smith, J.L., Naik, S. "Determination of Urea Nitrate and Guanidine Nitrate Vapor Pressures by Isothermal Thermogravimetry," *Propellants, Explosives, Pyrotechnics*, in press.

O.J. Gregory, H. Ghonem, M.J. Platek, J. Oxley, J. Smith, M. Downey; C. Cummiskey; E. Bernier, "Microstructural Characterization of Pipe Bomb Fragments", *Materials Characterization*, Vol.61, No. 3, p.347-354, March 2010.

Gregory, O.: Platek, M; Oxley, J.C. "Characterization of Pipe Bomb Fragments using Optical Microscopy and Scanning Electron Microscopy" *Microscopy & Microanalysis* 2010.

PUBLICATIONS

Oxley, J.C.; Smith, J.L.; Junqi, Y.; Moran, J. "Hypergolic Reactions of TNT," *Propellants Explos. Pyrotech.* **2009**, 34(5), 421-426.

Oxley, J.C.; Smith, J.L.; Luo, W; Brady, J. "Determining the Vapor Pressure of Diacetone Diperoxide (DADP) and Hexamethylene Triperoxide Diamine (HMTD)," *Propellants Explos. Pyrotech.*, **2009**, 34(6), 539-543.

Oxley, J.C.; Smith, J.L.; Higgins, C.; Bowden, P.; Moran, J.; Brady, J.; Aziz, C.E.; Cox, E. "Efficiency of Perchlorate Consumption in Road Flares, Propellants and Explosives," *J. Environ. Management*, 2009 90(11), 3629-34.

Oxley, J.C., Smith, J.L.; Huang, J.; Luo, W. "Destruction of Peroxide Explosives," *J. Forensic Sci.*, **2009** 54(5), 1029-33.

Oxley, J.C., Smith, J., Bernier, E., Moran, J.S., Luongo, J. "Hair as Forensic Evidence of Explosives Handling," *Propellants, Explosives, Pyrotechnics*, **2009** 34(4), 307-314.

Oxley, J.C., Smith, J.L., Naik, S., Moran, J.S. "Decompositions of Urea and Guanidine Nitrates," *Journal of Energetic Materials*, **2009** 27(1), 17-39.

Lancaster, S.L.; Marshall, M., Oxley, J.C. *Explosion Debris: Laboratory Analysis* of in Wiley Encyclopedia of Forensic Science, Jamieson, A.; Moenssens, A. (eds). Wiley, Chichester, UK pp1028-1060.

Aspects of Explosive Detection, ed. M. Marshall & J.C.Oxley; Elsevier **2009**.

Oxley, J.C., Smith, J.L., Moran, J.S. "Decomposition of Azo & Hydrazo linked Bis Triazines," *Journal of Energetic Materials*, **2009**, 27(2) 63 – 93.

Oxley, J.C., Smith, J.L., Kirschenbaum, L.J., Marimganti, S., Vadlamannati, S., "Detection of Explosives in Hair Using Ion Mobility Spectrometry," *J. Forensic Science*, **2008**, 53(3), 690-693.

Oxley, J.C., Koppes, W.M., Moran, J.S., Smith, J.L. "Azo Bond Hydrogenation with Hydrazine, R-NHNH₂, and Hydrazobenzene," *Tetrahedron Letters* **2008**, 49, 3234-3237.

Jimmie Oxley, James Smith, Joseph Brady, Faina Dubnikova, Ronnie Kosloff,* Leila Zeiri, Yehuda Zeiri "The Raman and IR fingerprint spectroscopy of peroxide-based explosives" *J. Applied Spectroscopy* **2008**, 62 (8), 906-915

Oxley, J.C., Smith, J.L., Moran, J.S.; Almog, J. "Nitroguanidine, and EGDN: nitration using simple nitro species" *Tetrahedron. Letters*, **2008**, 49(28), 4449-4451

J. C. Oxley; J. L. Smith; L. Kirschenbaum; S. Marimnganti "Accumulation of Explosives in Hair: Part II: Factors Affecting Sorption" *J Forensic Science*; **2007**, Vol 52, No. 6, 1291-1296.

W.M. Koppes, D. M. Rosenberg, M. E. Sitzmann, B W. Vos, K.A. Clark, P. Politzer, JS. Murray, J.C. Oxley, J S. Moran "Synthesis of 1,3,5-triazine-based energetic materials and the hypergolic ignition of nitroaromatic explosives" ACS Regional Meeting, SERMACS 2006, November 1-4, 2006, Augusta, GA

J.C Oxley; J.L. Smith; R. Bucu; J. Huang "A Study of Reduced-Sensitivity RDX" *J Energetic Materials* **2007**, 25, 141-60.

J. C. Oxley; J. L. Smith; E. Foote; J. Yue "Thermal Decomposition of TNT and RDX in Soil 1 & 2: Batch Studies at Elevated Temperature" *submitted Journal of Thermal Analysis and Calorimetry* Aug 2006

J. C. Oxley; J. L. Smith; J. Yue, J. Moran "Hypergolic Reactions of TNT" *submitted Journal of Thermal Analysis and Calorimetry* Aug 2006

J. C. Oxley, J. L. Smith, L. Kirschenbaum, K. P. Shinde, S. Marimnganti "Accumulation of Explosives in Hair" *J. Forensic Science*, **2005**, Vol 50, No. 4

Oxley, J.C.; Smith, J.L.; Moran, J.; Shinde, K. "Determination of the Vapor Density of Triacetone Triperoxide (TATP) Using A Gas Chromatography Headspace Technique" *Propellants, Explosives, Protechnics*, **2005**, 30.2, 127-130.

Oxley, J.C. "A Survey of the Thermal Stability of Energetic Materials" Chp 1 in "Energetic Materials: Part 2. Detonation, Combustion;" P. Politzer & J. Murray Eds, Elsevier, 2003, 5-30.

Oxley, J.C. "The Thermal Stability of Explosives" Chp. 8 in Handbook of Thermal Analysis and Calorimetry: Vol 2 in Applications to Inorganic and Miscellaneous Materials, P. K. Gallagher & M. E. Brown, Eds. Elsevier, 2003, 349-369.

Oxley, J.C.; Smith, J.L.; Resende, E.; Pearce, E "Quantification and Aging of the Post-Blast Residue of TNT Landmines" *J. Forensic Sci*, July 2003, 48(4), 742-752.

Oxley, J.C.; Smith, J.L.; Resende, E.; Pearce, E.; Chamberlain, T. "Trends in Explosive Contamination" *J. Forensic Science* 2003, 48(2), 1-9.

Marshall, M; Sanders, K.; Oxley, J.; Smith, J.; Egee, L. "Explosive Recovery from Hair" *Science & Justice* 2002, 42 No.3, 137-142

Oxley, J.C.; Smith, J.L.; Chen, H. "Decomposition of Multi-Peroxidic Compound: Triacetone Triperoxides (TATP)" *Propellants, Explosives and Pyrotechnics* 2002, 27, 209-216.

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Special Issue *Thermochemica Acta Energetic Materials*; Guest Editors: Oxley, Minier (32 articles) 2002, 384(1-2).

Oxley, J.C.; Smith, J.L.; Rogers, E.; Yu, M. "Kinetic Studies on Ammonium Nitrate Formulations: the Search for Explosivity Modifiers," *Thermochemica Acta*. 2002, 384(1-2), 23-45.

Oxley, J.C.; Smith, J.L.; Chen, H. "Thermal Decomposition of High-Nitrogen Energetic Compounds—Dihydrazido-s-tetrazine Salts" *Thermochemica Acta* 2002, 384(1-2), 91-99.

Oxley, J. C.; Smith, J. L.; Rogers, E.; Ye, W.; Aradi, A.; Henley, T. "Heat-Release Behavior of Fuel Combustion Additives" *Energy and Fuel*, 2001, 5, 1194-1199.

Oxley, J.C.; Smith, J.L.; Resende, E. "Determining Explosivity Part II: Comparison of Small-Scale Cartridge Test to Actual Pipe Bombs" *J. Forensic Science* 2001; 46(5): 1070-1075.

Oxley; J.C.; Smith, J.L.; Resende,E.; Rogers, E.; Strobel, R.A.; Bender, E. C. "Improvised Explosive Devices: Pipe Bombs" *J. Forensic Sci* 2001; 46(3):87-110

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Oxley; J.C.; Smith, J.L.; Zhang, J. "Decomposition of 3,6-Substituted s-Tetrazines;" *J. Phys. Chem. A* 2000, 104(29), 6764- 6777.

Zhang, J.; Oxley, J.; Smith, J., Cioffi, E. "Mass Spectra of Unlabeled and Isotopically Labeled Hexamethylene Triperoxide Diamine (HMTD)" *Propellants, Explosives and Pyrotechnics*, 2000, 25, 1-4.

Oxley, J. C.; Smith, J. L.; Rogers, E.; Ye, W.; Aradi, A.; Henley, T. "Fuel Combustion Additives: A Study of their Thermal Stabilities and Decomposition Pathways" *Energy and Fuel*, 2000, 14(6), 1252-1264.

Oxley, J.C.; Smith, J.L.; Rogers, E.and Dong, X. "Gas Production from Thermal Decomposition of Explosives: Assessing the Thermal Stabilities of Energetic Materials from Gas Production Data" *J. Energetic Materials* 2000, 18, 97-121.

George, V.; Jenkins, T.F; Phelan, J. M.; Leggett, D.C.; Cragin, J. H.; Webb, S.W.; Oxley, J.C.; Smith, J.L.; Berry, T.E.; Miyares, P.H. "Progress on Determining the Vapor Signature of a Buried Landmine" Proceed. 14th Annual International Symp. on Aerospace/Defense Sensing, Simulation, & Controls, April 2000, Orlando, FL, pp 240-261.

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Zhang, J.; Oxley, J.; Smith, J.; Bedford, C.; Chapman, R. "Mass Spectral Fragmentation Pathways in Cyclic Difluoroamino and Nitro Compounds" *J. Mass Spectrometry*, 2000, 35, 841-852.

Oxley, J.C.; Smith, J.L.; Rogers, E; Hamad, M.A.; Resende, E. "Small Scale Explosivity Testing" *J. Energetic Materials*, 1999, 17(4), 331-343.

Coburn, M.D.; Hiskey, M.A.; Oxley, J.C.; Smith, J.L.; Zheng, W.; Rogers, E. "Synthesis and Spectra of Some ²H, ¹³C, and ¹⁵N Isomers of 1,3,3-Trinitroazetidide and 3,3-Dinitroazetidinium Nitrate" *J. Energetic Materials*, 1998, 16, 73-99.

Oxley, J.C. "The Chemistry of Explosives" Chpt 5 in "Explosives Effects and Applications" ed. Walters, B. and Zukas, J.; Springer, New York, 1998, pp. 137-172.

Oxley, J.C. "Safe Handling of Explosives" Chpt 9 in "Explosives Effects and Applications" ed. Walters, B. and Zukas, J.; Springer, New York, 1998. 341-380.

Oxley, J.C.; Smith, J.L.; Zheng, W.; Rogers, E.; Coburn, M.D. "Thermal Decomposition Studies on Ammonium Dinitramide(ADN) & ¹⁵N & ²H Isotopomers" *J. Phys. Chem*, 1997, 101(31) 5646-5652.

Oxley, J.C.; Smith, J.L.; Zheng, W.; Rogers, E.; Coburn, M.D. "Thermal Decomposition Pathways of 1,3,3-Trinitroazetidide (TNAZ), Related 3,3,-Dinitrozetidinium Salts, and ¹⁵N, ¹³C, and ²H Isotopomers" *J. Phys. Chem A* 1997, 101(24) 4375-4483.

Oxley, J.C.; Smith, J.L.; Rogers, E.; Dong X.X. "NTO Decomposition Products Tracked with N-15 Labels" *J. Phys. Chem.*, 1997, 101, 3531-3536.

Gardner, J.S.; Oxley, J.C.; Smith, J.L. "Thermal Stability of a HAN-Based Liquid Gun Propellant" *J. Thermal Analysis* 1997, 49(3), 1315-1319.

Zheng, W.; Dong, X.X.; Rogers, E.; Oxley, J.C.; Smith, J.L. "Improvements in Determination of Decomposition Gases from 1,3,3-Trinitroazetidide (TNAZ) and 5-Nitro-2,4,-dihydro-3H-1,2,4-triazol-3-one (NTO) using Capillary Gas Chromatography/Mass Spectrometry" *J. Chromat. Sci.*, 1997, 35, 478-482.

Zheng, W.; Rogers, E.; Coburn, M.D.; Oxley, J.C.; Smith, J.L. "Mass Spectral Fragmentation Pathways in 1,3,3-Trinitroazetidide" *J. Mass Spectrometry*, 1997, 32, 525-532.

Gardner, J.S.; Oxley, J.C.; Smith, J.L.; Roger, E.; Yeager, K; Zheng, W. "Microcalorimetry Studies on HAN-Based Liquid Propellant," Proceed. JANNAF Propulsion Systems Hazards Subcommittee, Huntsville, AL 1997.

PUBLICATIONS (cont.)

J.C. Oxley; J.L. Smith; K.E. Yeager; E. Rogers; X.X. Dong "NTO Decomposition Studies" in *MRS Decomposition, Combustion, & Detonation Chemistry of Energetic Materials* editors Brill, Russell, Tao, Wardle, 1996, 135-142.

Oxley, J.C.; Smith, J.L.; Ye, H.; McKenney, R.L.; Bolduc, P.R. "Thermal Stability Studies on Homologous Series of Nitroarenes" *J.Phys.Chem*, 1995, 99, 9593-9602.

Oxley, J.C.; Smith, J.L.; Zhou, Z.; McKenney, R.L. "Thermal Decomposition Studies on NTO and NTO/TNT" *J.Phys.Chem*, 1995, 99, 10383-10391.

Oxley, J.C.; Smith, J.L.; Yeager, K.E.; Coburn, M.D.; Ott, D.G. "Synthesis of ¹⁵N-Labeled Isomers of 5-Nitro-2,4-dihydro-3h-1,2,4-triazol-3-one (NTO)" *J. Energetic Materials* 1995, 13(1&2), 93-105.

Oxley, J.C.; Smith, J.L.; Valenzuela, B. "Ammonium Perchlorate Decomposition: Neat and Solution" *J. Energetic Materials* 1995, 13(1&2), 57-91.

Oxley, J.C.; Kooh, A.; Szeckeres, R.; Zheng, W. "Mechanisms of Nitramines Thermolysis" *J.Phys.Chem*. 1994, 98, 7004-7008.

Oxley, J.C.; Smith, J.L.; Valenzuela, B. "Ammonium Perchlorate Thermal Decomposition: Neat and Solution" Proceeding of 23rd NATAS Conf.; Toronto, ON; Sept. 1994.

Oxley, J.C.; Smith, J.L.; Wang, W. "Compatibility of Ammonium Nitrate with Monomolecular Explosives, Part I" *J.Phys.Chem*. 1994, 98, 3893-3900.

Oxley, J.C.; Smith, J.L.; Wang, W. "Compatibility of Ammonium Nitrate with Monomolecular Explosives, Part II: Nitroarenes" *J.Phys.Chem*. 1994, 98, 3901-3907.

Oxley, J.C. "Non-Traditional Explosives: Potential Detection Problems" *Terrorism and Political Violence* 1993, 5(2), 30-47.

Wang, W.; Oxley, J.C.; Smith, J.L.; Gilson, N.S. "Thermal Compatibility of Ammonium Nitrate Mixtures with Energetic Organic Species" Proceed. 22nd NATAS Conf.; Denver, CO. Sept. 1993.

Oxley, J.C.; Smith, J.L.; Ye, H.; Wang, J.; Feng, H.; McKenney, R.L.; Bolduc, P.R. "Thermal Stability Studies on Nitroarenes" Proceed. 10th International Detonation Symposium; Boston, MA. July, 1993.

Oxley, J.C.; Smith, J.L.; Askins, J. A.; Gilson, N. S.; Feng, H.; Banks, M.; and Gardner, J.S. "Thermal Stability Analysis of HAN-Based Liquid Gun Propellants," Proceed. JANNAF Propulsion Systems Hazards Subcommittee, Fort Lewis, WA, May 11-13, 1993.

Oxley, J.C.; Kooh, A.B.; Szeckeres, R.; Zheng, W. "Mechanisms of Nitramine Thermolysis" Proceedings of ADPA Energetic Materials Technology, Oct. 4-7, 1992, New Orleans.

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Oxley, J.C.; Olson, D.B.; Sandstrom, F. "NMIMT Hazard Testing Capabilities" Proceed. of 21nd NATAS Conf.; Atlanta, Sept. 1992.

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Oxley, J.C.; Kaushik, S.M.; Gilson, N.S. "Ammonium Nitrate Explosives-- Thermal Stability and Compatibility on Small & Large Scale" *Thermochem. Acta* 1992, 212, 77-85.

Oxley, J.C. Hiskey, M.A., Naud, D.; Szekeres, R. "Thermal Decomposition of Nitramines: Dimethylnitramine, Diisopropyl-nitramine, and N-Nitropiperidine" *J. Phys. Chem.* 1992, 96, 2505-2509.

Oxley, J.C.; Kaushik, S.M.; Gilson, N.S. "Thermal Stability and Compatibility of Ammonium Nitrate Explosives on Small and Large Scale" Proceeding of 20th NATAS Conf.; Minneapolis, MN, Sept. 1992.

Oxley, J.C. "Explosives Detection" *SPIE* San Diego, July 1992

Minier, L.; Brower, K.; Oxley J.C. "The Role of Intermolecular Reactions in Thermolysis of Aromatic Nitro Compounds in Supercritical Aromatic Solvents" *J. Org. Chem.* 1991, 56, 3306-3314.

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Minier, L.; Oxley J.C. "Thermolysis of Nitroarenes: 2,2',4,4',6,6'-Hexanitrostilbene" *Thermochem. Acta* 1990, 166, 241-249.

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Hiskey, M.A.; Oxley, J.C. "A New Synthetic Route to Nitrate Esters" *J. Energetic Materials* 1989, 7(3), 199-205.

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Brower, K.R.; Oxley, J.C.; Tewari, M.P. "Homolytic Decomposition of Ammonium Nitrate at High Temperature" *J. Phy. Chem.* 1989, 93, 4029-4033

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