CURRICULUM VITAE

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Education:

Ph.D., Chemical Physics, 1993, Ohio State University

M.S., Aerospace and Mechanical Engineering, 1987, Moscow Institute of Physics and Technology

Experience:

2009-current, Professor, Department of Mechanical and Aerospace Engineering, Chemical Physics Graduate Program, OSU

- 2019, Visiting Professor (sabbatical leave), Clean Combustion Research Center, King Abdullah University of Science and Technology (KAUST), Jeddah, Saudi Arabia
- 2018, Gaspard Monge Visiting Professor (sabbatical leave), Laboratory of Plasma Physics, Ecole Polytechnique, Paris, France
- 2011, Japan Society for Promotion of Science Fellow (sabbatical leave), Department of Energy Science, Tokyo Institute of Technology, Japan
- 2010-2011, Visiting Professor (sabbatical leave), Department of Physics and Astronomy, Ruhr University Bochum, Germany

2001-2009, Associate Professor, Department of Mechanical Engineering, Department of Aerospace Engineering and Aviation, Chemical Physics Graduate Program, OSU

1994-2001, Research Scientist, Post-Doctoral Researcher, Visiting Assistant Professor, Nonequilibrium Thermodynamics Laboratories, Department of Mechanical Engineering, OSU

1991-1993, Graduate Research Associate, Molecular Energy Transfer Laboratory, Chemical Physics Graduate Program and Department of Mechanical Engineering, OSU

1987-1991, Research Associate, Aerothermodynamics Laboratory, A.V. Lykov Heat and Mass Transfer Institute of Soviet Academy of Sciences, Minsk, USSR

1981-1987, BS/MS student, Department of Aerophysics and Space Research, Moscow Institute of Physics and Technology, Moscow, USSR

Research Interests:

- Kinetics of nonequilibrium plasmas and high-speed nonequilibrium reacting flows
- Molecular energy transfer
- Plasma-assisted ignition, combustion, and flameholding
- Plasma flow control
- Molecular lasers
- Laser diagnostics of plasmas and reacting flows
- Kinetic modeling

Major Research Accomplishments:

- *Demonstrating feasibility of a new CO chemical laser using carbon vapor and air as reactants, and operating in a high-speed air flow. Generation of strongly vibrationally excited CO in this reaction, in collision-dominated environment (see* ***Aerospace America****, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2015, December 2016).* In this approach, highly vibrationally excited carbon monoxide (CO) is generated by a chemical reaction between carbon vapor and molecular oxygen. CO reaction product, generated at low temperatures, produces population inversion among CO vibrational levels, in a collision-dominated environment. These results demonstrate feasibility of development of a new CO chemical laser using carbon vapor and air as reactants, and operating in a high-speed air flow. **See Refs. 1.124, 1.143**

  Impact: development of high-power airborne laser system for on-board electrical power generation

- *Development of nanosecond pulse, low-temperature surface plasma actuators for high-speed flow control; experimental demonstration of shock wave formation by repetitive ns pulse discharges in quiescent air; experimental demonstration of boundary layer flow reattachment in high-speed flows over airfoils, up to $M=0.3$ and $Re \sim 10^6$; experimental demonstration of bow shock control in a Mach 5 flow (see* ***Aerospace America****, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2011, December 2012).* This mechanism of flow control is entirely different from that used in AC Dielectric Barrier Discharge (DBD) plasma actuators, and is due to rapid thermalization of energy coupled to the actuator, on sub-microsecond time scale. This produces repetitive thermal perturbations in the flow, resulting in formation of large-scale structures (vortices). Varying the forcing frequency can be used to induce flow instabilities. Actuator size is scalable up to ~1 m span dimensions. Low power budget of these plasma actuators (~ 0.1 W/cm) makes them attractive for practical flow control applications. **See Refs. 1.78, 1.80, 1.83, 1.84, 1.90, 1.107**

  Impact: development of low plasma power, lightweight, scalable plasma actuator technology

- *Development of a c.w., electrically excited, gasdynamic oxygen-iodine laser operating at high pressures (see* ***Aerospace America****, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2006 and December 2008).* A combination of two overlapping electric discharges (repetitive ns pulse discharge and DC sustainer discharge) is used to generate metastable singlet delta oxygen (SDO) in oxygen-helium flows, instead of using complex, two-phase chemical reactions. SDO generated by the discharge sustained in the nozzle plenum is used to produce iodine atom population inversion in a Mach 3 laser cavity. Small signal gain in the cavity exceeds 0.2%/cm, which approaches performance of conventional, chemical oxygen-iodine lasers, and resulted in generating laser power of up to several hundred W. **See Refs. 1.39, 1.45, 1.50, 1.55, 1.68, 1.69, 1.73**

  Impact: development of high-power, electrically excited airborne laser systems

- *Development of high-amplitude, high bandwidth localized arc plasma flow actuators for high-speed flow control; experimental demonstration of plasma-controlled mixing enhancement and noise reduction in Mach 0.9-2.0, 1 atm static pressure jet flow (see* ***Aerospace America****, Engineering Notebook: Plasma Arcs Soften Jet Engine Noise, January 2005;* ***Aerospace America****, A Year in Review: Fluid Dynamics Research Highlights, December 2006;* ***Aerospace America****, A Year in Review: Aeroacoustics Research Highlights, December 2008*). **U.S. Patents 7,334,394 and 7,669,404.** The use of localized arc plasma actuators demonstrates dramatically enhanced mixing and broadband jet noise reduction in high-speed (Mach 0.9-2.0), high static pressure (P=1 atm) jet flows. Repetitively pulsed plasma actuators produce localized thermal perturbations generating large-scale coherent structures (vortices) in the flow. The advantages of arc plasma actuators compared with solid obstacles are variable forcing frequency at high forcing amplitude, as well as turning them on and off at will. Varying the forcing frequency can be used to induce jet column instability and shear layer instability. Low power budget of the plasma actuators (a few tens of Watts each, or about 0.1% of the flow power) makes them attractive for practical applications, such as jet mixing enhancement and noise reduction in aircraft jet engines. **See Refs. 1.33, 1.47-1.49, 1.72, 1.74**

Impact: fundamental insight into plasma flow control / noise reduction mechanisms; development of energy efficient, lightweight, large-scale turbojet engine noise suppression technology

- *Conception, development, and demonstration of non-thermal ignition and flameholding using nonequilibrium RF and repetitive nanosecond pulse plasmas* (*see* ***Aerospace America****, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2003 and December 2005*). Ignition and flameholding of premixed fuel-air flows is produced using nonequilibrium plasmas, at temperatures significantly lower than autoignition temperature. Ignition produced in a wide range of equivalence ratios, including lean mixtures outside flammability limits. The plasma stabilizes the flame, without the use of flameholders. Large-volume ignition by low-temperature plasmas may be used for high-altitude relight in jet engines at low combustor pressures, and for lean flame stabilization. **See Refs. 1.34, 1.40, 1.46, 1.56, 1.59, 1.62, 1.76, 1.77, 1.81, 1.82, 1.88, 1.100, 1.109, 1.121**

  Impact: development of nonequilibrium plasma igniters / flameholders for scramjet engines and turbojet engine afterburners

- *Measurements of excited species and radicals in well-characterized repetitive nanosecond pulse plasmas; development of a low-temperature plasma-assisted combustion mechanism* (***Distinguished Papers, 34th and 35th International Symposia on Combustion, 2013 and 2015***). Laser diagnostics (Thomson scattering, Raman scattering, CARS, LIF, TALIF, calibrated emission spectroscopy), time-resolved measurements of electron density, N_2 vibrational level populations, absolute number densities of singlet delta oxygen molecules, O, H, and N atoms, OH and NO radicals, and temperature in fuel-oxidizer mixtures excited by a ns pulse discharge. Use of these data for development and validation of kinetic mechanisms of plasma assisted fuel oxidation and ignition. **See Refs. 1.94, 1.101, 1.106, 1.111, 1.112, 1.116, 1.119, 1.120, 1.122, 1.126, 1.130, 1.131, 1.135, 1.136**

  Impact: fundamental insight into kinetic mechanisms of ignition by low-temperature plasmas

- *Development of new laser diagnostics for non-intrusive measurements of electric field in high-pressure transient plasmas by ps and ns four-wave mixing (**AIAA Plasmadynamics and Lasers Technical Committee 2015 Best Paper Award**) and ps second harmonic generation.* Measurements of electric field in volumetric and near-surface AC DBD and ns pulse discharges in hydrogen and air, in AC DBD and ns pulse surface plasma actuators, and in atmospheric pressure hydrogen and methane flames enhanced by AC and ns pulse discharges, with sub-ns temporal resolution. **See Refs. 1.115, 1.117, 1.123, 1.132, 1.137, 1.138, 1.140, 1.141, 1.144-1.147, 1.149-1.153**

  Impact: fundamental insight into kinetics of ionization, transport, and plasma chemical reactions in transient air plasmas

- *Experimental demonstration and kinetic modeling prediction of two-stage energy thermalization / heating mechanism in high specific energy loading, ns pulse discharge plasmas (see **Aerospace America**, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2015).* Time-resolved, spatially-resolved measurements of temperature and N_2 vibrational level populations by

CARS, combined with kinetic modeling, demonstrated that energy thermalization / heating in ns pulse discharges occurs on two widely different time scales, "rapid" heating on sub-acoustic time scale (due to quenching of excited electronic states of N_2) and "slow" heating (due to vibrational relaxation of N_2 by O atoms). "Rapid" heating results in generation of localized thermal perturbations, which is the dominant mechanism of high-speed plasma flow control by ns pulse plasma actuators. **See Refs. 1.95, 1.96, 1.107, 1.113, 1.121**

Impact: fundamental insight into kinetic mechanisms of high-speed flow control by pulsed plasmas; development of efficient plasma actuator technology

- *Experimental characterization and development of predictive models of energy coupling and radical species generation in ns pulse discharges.* Dynamics of discharge development, energy coupling, and radical species generation in nanosecond pulse discharges is quantified for different geometries, including volume and surface ionization wave discharges, and surface ionization wave discharges over a liquid-vapor interface, over a wide range of parameters. **See Refs. 1.66, 1.79, 1.85, 1.90, 1.104, 1.107, 1.117**

  Impact: fundamental insight into plasma dynamics and energy coupling during ns pulse breakdown; applications for plasma assisted combustion, high-speed plasma flow control, and plasma fuel reforming.

- *Suggestion, development, and demonstration of new method of flow control in low-temperature supersonic weakly ionized boundary layer using Lorentz force (see* ***Aerospace America****, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2005). Experimental demonstration of cold, weakly ionized Mach 3 air flow deceleration by Lorentz force (see* ***Aerospace America****, A Year in Review: Thermophysics Research Highlights, December 2006).* Experiments in a low-temperature, ionized Mach 3 supersonic boundary layer detected magnetohydrodynamic (MHD) effect on boundary layer density fluctuations at these conditions. Retarding Lorentz force applied to M=3 nitrogen and air flows increases density fluctuation intensity by up to 25%, compared to the accelerating force of the same magnitude. Static pressure measurements in supersonic, low-temperature MHD / nonequlibrium plasma flows (Mach 3-4) demonstrated that retarding Lorentz force can reduce the flow velocity by 2-3%. This method of boundary layer control can be used for drag reduction on supersonic and hypersonic vehicles. **See Refs. 1.37, 1.38, 1.43, 1.54, 1.74, 1.75**

  Impact: development of plasma / MHD flow control methods for hypersonic airbreathing flight

- *Demonstration and development of a new method of visible/UV radiation suppression from weakly ionized plasmas (see* ***Aerospace America****, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2003*). Experiments demonstrated that removing electrons from low-temperature, vibrationally nonequilibrium, weakly ionized plasmas dramatically reduced visible/UV radiation from the plasma (CO 4^{th} positive system, NO β and γ bands, and CN violet system). In some cases, UV/visible emission was almost completely extinguished. These emission bands are among the most dominant in high-altitude rocket plume emission. The results show that energy transfer from vibrationally excited molecules to excited electronic species (V-E energy transfer) in nonequilibrium plasmas is mediated by electrons, and can be inhibited by removing electrons from the plasma. This approach may be used for control of high-altitude plume emission signatures. **See Refs. 1.29, 1.35**

  Impact: fundamental insight into kinetic mechanisms of energy transfer and radiation in low-temperature molecular plasmas; control of high-altitude missile plume emission signatures

- *Development and demonstration of the use of ns pulser – DC sustainer discharges for generation of stable, large volume plasmas in high-speed air flows (M=4); use of this method for high-speed flow control, plasma ignition, and high-power lasers* (*see* ***Aerospace America****, A Year in Review: Plasmadynamics and Lasers Research Highlights, December 2006*). Stable and diffuse nonequilibrium plasmas formed by a crossed discharge (repetitive ns pulse discharge overlapped with DC sustainer discharge) are generated in high-speed flows of nitrogen, air, air-fuel mixtures, and oxygen-helium mixtures. Stability of these discharges is due to very low duty cycle of ns pulsed discharge, ~1/1000. This method of high-pressure plasma generation is used for supersonic boundary layer control, nonequilibrium plasma assisted ignition, and development of electrically excited oxygen-iodine laser. **See Refs. 1.38, 1.39, 1.43, 1.45, 1.50, 1.55, 1.58, 1.75, 1.87, 1.91**

  Impact: sustaining stable high-pressure plasmas for applications in plasma flow control, plasma-assisted combustion, and high-power lasers

- *Experimental demonstration of a purely thermal nature of shock wave weakening in electric discharge plasmas.* Experiments conducted in steady-state, well-characterized supersonic flows show that oblique shocks can be weakened by the nonequilibrium RF plasma (shock angle increased by up to 14^0, which corresponds to flow Mach number reduction from M=2.0 to 1.8). Flow temperature measurements show that the Mach number reduction is consistent with the flow heating by the plasma, demonstrating purely thermal nature of this effect. This study was motivated by previous experiments indicating acceleration and weakening of shock waves propagating in nonequilibrium gas discharge plasmas ("plasma shock effect"), which resulted in significant wave drag reduction. This work helped ending a controversy on the interpretation of these experiments. **See Refs. 1.16, 1.23, 1.27, 1.31**

  Impact: use of plasma and laser generated temperature gradients to weaken shock waves for supersonic vehicle drag reduction and steering

- *Suggestion, development, and demonstration of a new approach to sustaining stable high-pressure plasmas using a combination of infrared lasers and a sub-breakdown RF electric field.* Initial ionization in these plasmas is produced in collisions of CO molecules excited to high vibrational levels. Further vibrational excitation is produced by free electrons heated by the applied RF field, which results in additional ionization by the same mechanism. The applied field is low, which precludes electron impact ionization. Stability of these low-temperature plasmas is enabled by the negative feedback between gas heating and rate of ionization. The use of a sub-breakdown RF field in addition to the CO laser allows plasma volume increase by up to an order of magnitude. This approach sustains large-volume high-pressure molecular plasmas without the use of a high-power CO laser, with applications for high-yield plasma chemical synthesis and plasma material processing. **See Ref. 1.25**

  Impact: fundamental insight into kinetics mechanisms of ionization and vibrational energy transfer in low-temperature molecular plasmas; generating high-pressure plasmas for materials processing

- *Conception, development, and demonstration of a new method of ionization rate, electron density, and electron recombination rate measurements using a DC/RF Thomson discharge; measurements of these parameters in weakly ionized plasmas.* Non-self-sustained Thomson discharge can remove electrons from weakly ionized plasma without producing additional ionization. Current voltage characteristics of such discharges powered by DC and RF voltage are related to the rate of electron production in the plasma and electron density, respectively. These parameters are measured in optically pumped plasmas, based on the kinetic model of the Thomson discharge. The results provide new insight into ionization kinetics of nonequilibrium plasmas. **See Refs. 1.2, 1.19, 1.22, 1.24, 1.27, 1.57, 1.67**

Impact: fundamental insight into kinetic mechanisms of ionization in molecular plasmas in the absence of externally applied electric fields, combustion control in high-speed flows

- *Suggestion, development, and demonstration of novel method of vibrational energy storage in high-density mixtures (up to 1 atm) of diatomic molecules (N_2, O_2, CO, and NO) using infrared lasers.* Theoretical estimates and kinetic modeling predicted that air can be strongly vibrationally excited at steady state by seeding it with a few per cent of CO and optically pumping it with a low-power CO laser. Laser beam energy is absorbed by vibrational energy mode of CO molecules, followed by rapid collisional energy transfer from CO to nitrogen and oxygen. Experiments in CO-seeded atmospheric pressure air optically pumped by a c.w. CO laser confirmed these predictions. Steady-state vibrational temperatures of N_2, O_2, and CO at these conditions are up to T_v=3000 K, at the gas temperature of T=300-350 K. **See Refs. 1.20, 1.21, 1.36**

  Impact: fundamental insight into kinetics of vibrational energy transfer in low-temperature molecular plasmas; sustaining long lifetime, high-pressure air plasmas at low power budget

- *Conception, development, and demonstration of a new method of plasma lifetime increase (up to 2-3 orders of magnitude) in cold molecular plasmas using vibrational excitation (**AIAA Plasmadynamics and Lasers Technical Committee 2004 Best Paper Award**).* Experiments are conducted in electron beam generated low-temperature plasmas, sustained in atmospheric pressure air seeded with a few percent of CO and vibrationally excited by a CO laser. The results demonstrated that vibrational excitation of air species increases the plasma lifetime at near room temperature from ~100 ns to at least a few tens of μs. This occurs due to nearly complete inhibition of electron attachment to oxygen by its vibrational excitation. The main application of this effect is sustaining large-volume, low-temperature air plasmas at a low power budget. **See Refs. 38, 53**

  Impact: fundamental insight into kinetics of electron attachment in vibrationally nonequilibrium, low-temperature molecular plasmas; sustaining long lifetime, high-pressure air plasmas at low power budget

- *Development of non-perturbative analytic theory of vibrational energy transfer in three-dimensional molecular collisions.* Semiclassical probabilities and kinetic rates of vibration-translation and vibration-vibration energy exchange processes in three-dimensional collisions of vibrating and rotating molecules are predicted by analytic solution of coupled motion equations and Schrodinger equation. The fully analytic results do not rely on any adjustable parameters and are applicable within a wide range of temperatures and vibrational quantum numbers. The predicted rates are in good agreement with experimental data. The results are essential for development of multidimensional nonequilibrium flow codes with predictive capabilities. **See Refs. 1.5, 1.12, 1.15, 1.18, 1.26, 1.99, 1.142**

  Impact: fundamental insight into kinetics of close-coupled vibrational energy transfer in molecular plasmas; applications to atmospheric reentry flows, gas discharges, and molecular lasers

- *Development of kinetic models of nonequilibrium reacting ionized flows with high predictive capability.* Multiple state-specific kinetic models of electric discharge plasmas, optically pumped plasmas, molecular lasers, and nonequilibrium supersonic flows have been developed and exercised. The models have predictive capability and are critical for design and analysis of experiments involving nonequilibrium plasma flows. **See Refs. 1.1-1.6, 1.7-1.11, 1.17-1.22, 1.24-1.25, 1.29, 1.32, 1.35, 1.36, 1.41, 1.44, 1.52-1.54, 1.59, 1.60, 1.63, 1.65, 1.66, 1.71, 1.76, 1.79, 1.88, 1.90, 1.96, 1.100, 1.102, 1.103, 1.106, 1.109, 1.113, 1.115, 1.116, 1.121, 1.122, 1.129, 1.131, 1.135-1.137, 1.139, 1.144**

Impact: fundamental insight into coupled kinetics of ionization, electron loss processes, energy transfer, and nonequilibrium chemical reactions in molecular plasmas; applications for novel plasmachemical synthesis, plasma-assisted combustion, and molecular lasers

Attraction of External Funding 1999-2020 (percentage of proposal written and total dollars of the grant are indicated):

1. Principal Investigator, *Collaborative Research Center for Studies of Plasma-Assisted Combustion and Plasma Catalysis* (DOE, $3,000,000, 33%, 08/15/2019 – 08/14/2024)
2. Co-Principal Investigator, *Center for Low Temperature Plasma Interactions with Complex Interfaces* (DOE, $567,000, 100%, 08/15/2019 – 08/14/2024)
3. Principal Investigator, "*Energy Transfer Processes in Nonequilibrium Hypersonic Flows*" (AFOSR, 100%, $648,000, 09/01/17 – 08/31/20)
4. Principal Investigator, "*Supersonic Hyperthermal Power Supply Laser Power Extraction*" (Lockheed Martin Co., 100%, $575,000, 01/11/2017 - 10/15/2020)
5. Principal Investigator, "*Nanosecond Pulse Discharges at a Liquid-Vapor Interface and in Liquids: Discharge Dynamics and Plasma Chemistry"* (NSF, 100%, $384,000, 08/01/2016 – 07/31/2020)
6. Principal Investigator, *"Instrumentation for Studies of Molecular Energy Conversion for Efficient Control of High-Speed Flow Fields"* (AFOSR DURIP Instrumentation Grant, 100%, $282,000, 07/15/2016-07/14/2017)
7. Co-Principal Investigator, *"Novel power supply: Subsonic flowing C+O_2 laser study"* (Lockheed Martin Co., 50%, $75,000, 04/21/2015 - 08/17/2015)
8. Co-Principal Investigator, *"Fundamental Studies of Accelerated Low Temperature Combustion Kinetics by Nonequilibrium Plasmas"* (NSF, 50%, $300,000, 08/01/2014 – 07/30/2017)
9. Co-Principal Investigator, *"Center for Exascale Simulation of Plasma-Coupled Combustion"* (DOE, 50%, $1,375,000, 01/01/14 - 12/31/20)
10. Principal Investigator, "*Characterization of Velocity Field in Oblique Shock Boundary Layer Interaction Flow Using Molecular Tagging Velocimetry (MTV)*" (AFRL, 100%, $56,000, 08/01/2013 – 12/31/2013)
11. Principal Investigator, *"Kinetic Modeling of a Gasdynamic CO_2 Laser Driven by a Pulsed Detonation Engine"* (AFRL, 100%, $80,000, 12/01/12 – 06/30/13)
12. Co-Principal Investigator, *"Understanding and control of basic flow elements associated with rotorcraft using NS-DBD plasma actuators"* (ARO/ARL, 20%, $600,000, 09/01/12 – 08/31/15)
13. Principal Investigator, *"Nonequilibrium Molecular Energy Coupling and Conversion Mechanisms for Efficient Control of High-Speed Flow Fields"* (AFOSR, 50%, $600,000, 09/01/12 – 08/31/15)
14. Principal Investigator, *"Experimental and Modeling Studies of Oblique Shock Control by Surface Plasma Actuators"* (AFRL / Universal Technology Corporation, $145,000, 100%, 05/01/2012 – 04/30/2013)
15. Co-Principal Investigator, *"Novel CO Laser Power Extraction"* (Lockheed Martin Co., 50%, $275,000, 09/10/2012 - 05/01/2014)
16. Co-Principal Investigator, *"Exploration of Critical Nonequilibrium Processes in High Speed Viscous Dominated Flows, Task II: Nonequilibrium Hypersonic Shock Layer Flows"* (AFOSR, 33%, $1,025,000, 06/01/2011 - 5/31/2016)
17. Co-Principal Investigator, *"Kinetics of Non-Equilibrium Fast Ionization Wave Plasmas in Gas Phase and Gas-Liquid Interface"* (NSF, 50%, $270,000, 09/2011 - 08/2014)
18. Principal Investigator, "*Development of Kinetic Models and Predictive Computational Tools for High-Fidelity Simulation of Plasma Flow Control*" (AFRL / Universal Technology Corporation, $68,000, 100%, 02/01/2011 – 12/31/2011)

19. Principal Investigator, "*High-Fidelity Simulation of Dynamic Weakly Ionized Plasma Phenomena"*, (Phase I AFOSR STTR, in collaboration with TTC Technologies, Inc., 100%, $50,000, 07/15/2010 - 04/15/2011)
20. Co-Principal Investigator, *"Plasma Properties of High Pressure Ns Pulsed Discharges: Thomson Scattering, CARS and High Speed Imaging"*, Infrastructure Equipment for Collaborative Research on Evolution of Distribution Functions in Low Temperature Plasmas (DOE, $221,000, 50%, 09/01/2009 – 08/31/2014)
21. Co-Principal Investigator, *Low-Temperature Plasma Science Center "Predictive Control of Plasma Kinetics: Multi-Phase and Bounded Systems"* (DOE, $1,445,000, 50%, 09/01/2009 – 08/14/2019)
22. Principal Investigator, *"Exploration of Fluid Mechanical Effects of Nanosecond Pulse Dielectric Barrier Discharge Flow Control for Various Types of Separated Flows"* (Boeing, $50,000, 50%, 07/01/2009-12/31/2009)
23. Principal Investigator, *"Nanosecond Pulse Generator Development, Validation, and Delivery"* (Boeing, $125,000, 50%, 07/01/2009-12/31/2009)
24. Co-Principal Investigator, *"Fundamental Mechanisms, Predictive Modeling, and Novel Aerospace Applications of Plasma Assisted Combustion"* (AFOSR MURI, 40%, OSU share $2,400,000, 06/01/2009-05/30/2014)
25. Co-Principal Investigator, *"Instrumentation for Nonequlibrium Gas Dynamics of Supersonic Flows and Kinetic Studies of Plasma Assisted Combustion"* (AFOSR DURIP Instrumentation Grant, 50%, $171,000, 05/01/2009-04/30/2010)
26. Principal Investigator, *"Short Pulse Power System"* (Boeing, $50,000, 100%, 09/01/2008-11/30/2008)
27. Co-Principal investigator, *"Influence of Superequilibrium and Metastable Species on Nonequilibrium Plasma Combustion Kinetics"* (NSF, 50%, $312,000, 01/01/2008 - 12/31/2010)
28. Co-Principal Investigator, *"Nonequilibrium Gas Dynamics"* (AFOSR, 33%, $900,000, 01/01/2008 - 12/31/2010)
29. Principal Investigator, *"Nonequilibrium Ignition and Flameholding in High-Speed Reacting Flows"* (NASA NRA, 50%, $510,000, 01/01/2007 - 12/31/2009)
30. Co-Principal Investigator, *"Kinetic Studies of Plasma Assisted Combustion By Non-Equilibrium Discharges"* (AFOSR, 50%, $457,000, 01/01/2007 - 12/31/2009)
31. Co-Principal Investigator, *"Supersonic Jet Noise Suppression Using Plasma Actuators: Coupled Experiments, LES and Adjoint-based Optimization"* (NASA NRA, 25%, $707,000, 01/01/2007 - 12/31/2010)
32. Co-Principal Investigator, "*Active Control of High Reynolds Number Supersonic Jets Using Plasma Actuators*", (AFOSR, 25%, $389,000, 01/01/2007 - 12/31/2009)
33. Co-Principal Investigator, *"Development of energy efficient, multi-channel, pulsed plasma generator for high-speed flow control by localized arc plasmas"* (Phase I NASA SBIR, in collaboration with ISSI, Inc., 50%, $30,000, 01/19/2007 - 06/30/2007)
34. Principal Investigator, *"Computational Tool for Aerothermal Environment Around Transatmospheric Vehicles"* (Phase I NASA SBIR, in collaboration with CFDRC, 100%, $33,000, 02/01/2007 - 07/31/2007)
35. Principal Investigator, *"Electron Kinetics and Plasma Chemistry in Pulsed Discharges of Electronegative Gases"* (Phase I AFOSR SBIR, in collaboration with CFDRC, 100%, $40,000, 08/21/2006 - 04/30/2007)
36. Principal Investigator, *"Electric Discharge Oxygen-Iodine Laser Operating at High Pressure"* (Joint Technology Office, 50%, $781,000, 02/15/2006 - 02/15/2008)
37. Principal Investigator, *"Development of a Low-Temperature Airflow MHD Power Generation Module for Supersonic Flight Vehicles"* (Phase I AFOSR STTR, in collaboration with ISSI, Inc., 100%, $50,000, 09/01/2005 - 04/30/2006)

38. Co-Principal Investigator, *"Propulsion 21: Active Control of Jet Noise Using Plasma Actuators"* (NASA, 25%, $324,000, 05/01/2005 -04/30/2006)
39. Principal Investigator, *"Instrumentation for Generation and Optical Diagnostics of Large Volume, Repetitively Pulsed Fast Ionization Wave Plasmas in Supersonic Flows"* (AFOSR DURIP Instrumentation Grant, 50%, $185,000, 05/01/2005-04/30/2006)
40. Principal Investigator, "*Nonequilibrium Supersonic Magnetogasdynamic Wind Tunnel*" (AFOSR, 75%, $350,000, 01/01/2005 - 12/31/2007)
41. Principal Investigator, *"Development of a Novel Nonequilibrium Pulsed Plasma Ignition Module for High-Altitude Turbojet"* (Phase I NASA SBIR, in collaboration with ISSI, Inc., 75%, $23,000, 01/01/2005-06/30/2005)
42. Principal Investigator, *"Plasma Assisted Ignition Module for Aerospace Propulsion Systems"* (Phase II AFOSR STTR, in collaboration with PSI, 50%, $230,000, 10/01/2004 - 09/30/2006)
43. Co-Principal Investigator, *"Energy Transfer Processes Among Electrons and Vibrationally Excited Air Species in High Enthalpy Flows"* (AFOSR, 75%, $375,000, 11/15/2004 - 11/14/2007)
44. Co-Principal Investigator, *"Electric Discharge Oxygen-Iodine Laser"* (Phase II AFRL SBIR, in collaboration with PSI, 50%, $410,000, 07/01/2004 - 06/30/2006)
45. Co-Principal investigator, *"Influence of Vibrational Nonequilibrium on Electron Creation and Loss Kinetics in High Pressure Molecular Plasmas"* (NSF/DOE, 50%, $350,000, 07/01/2003 - 06/30/2006)
46. Principal Investigator, *"Magnetogasdynamic Power Extraction and Flow Conditioning For a Gas Turbine Engine"* (NASA Glenn, 75%, $25,000, 07/01/2002 - 12/31/2003)
47. Principal Investigator, *"Advanced Optical Diagnostics of Stable High-Pressure Supersonic Nonequilibrium Plasma Flows"* (AFOSR DURIP Instrumentation Grant, 75%, $45,000, 7/1/2002-6/30/2003)
48. Principal Investigator, *"Plasma Flow Control Technology for Hypersonic Boundary Layer Transition Control"* (Phase II AFRL SBIR, in collaboration with ISSI, Inc. and UCLA, 100%, $150,000, 08/07/2002 - 06/30/2005)
49. Co-Principal Investigator, *"Plasma and Photo-Ionization Approaches for Combustion Initiation"* (Phase I AFOSR STTR, in collaboration with PSI, 50%, $50,000, 09/15/2002 - 03/31/2003)
50. Principal Investigator, *"Experimental and Computational Study of the Effect of MHD Forces on Stability and Separation of Nonequilibrium Ionized Supersonic Flow"* (AFOSR, 75%, $300,000, 04/01/2002 - 12/31/2004)
51. Co-Principal Investigator, "*Active Flow and Acoustic Control Using Plasma Actuators"* (NASA, 25%, $100,000, 04/01/2002 -12/31/2002)
52. Co-Principal Investigator, *"Energy Transfer Rates and Mechanisms for Hypervelocity Vehicle Radiation"* (AFOSR, 75%, $300,000, 11/01/2001 - 10/31/2004)
53. Principal Investigator, *"Studies of Non-Thermal Ignition Phenomena for Aerospace Applications"* (Joint AFRL/DAGSI Basic Research Program", 75%, $145,000, 7/1/2001-6/30/2003)
54. Principal Investigator, *"Generation and Characterization of Stable, Weakly Ionized Air Plasmas in Hypersonic Flows"* (Joint AFRL/DAGSI Basic Research Program", 75%, $85,000, 7/1/2001-6/30/2003)
55. Co-Principal Investigator, *"Studies of Optically Pumped High Pressure Nonequilibrium Plasmas"* (NSF/DOE, 50%, $300,000, 07/01/2000 - 06/30/2003)
56. Principal Investigator, *"Development of Computational Nonequilibrium Plasma Dynamics Flow Code"* (NASA GRC, 75%, $80,000, 01/01/2000-12/31/2001)
57. Principal Investigator, *"Experimental Characterization of Shock Dispersions in Weakly Ionized Plasmas"* (MSE/NASA Langley, 100%, $100,000, 07/01/1999-06/30/2000)

Played a key role in generation of several research proposals funded by AFOSR in 1997-1999, including

58. AFOSR MURI *"Air Plasma Ramparts Using Metastable Molecules"* (25%, $2,500,000, 07/01/1997-06/30/2002)
59. AFOSR *"Studies of Anomalous Shock Wave Propagation and Dispersion in Weakly Ionized Plasmas"* (25%, $550,000, 01/01/1999-12/31/2001)

Total funding generated in 1999-2020 is $22.875M (solely responsible for $11.975M).

Courses Taught:

<u>*Undergraduate:*</u>
Mechanical Engineering 250 (Numerical Methods in Engineering), 1995
Aerospace Engineering 405 (Thermodynamics), 2002
Mechanical Engineering 501 (Thermodynamics I), 2010, 2011
Mechanical Engineering 502 (Thermodynamics II), 2003, 2006, 2008
Mechanical Engineering 3501 (Thermodynamics), 2012, 2013, 2016
Mechanical Engineering 503 (Fluid Mechanics I), 1999, 2002, 2006, 2007
Mechanical Engineering 510 and 4510 (Heat Transfer), 2004, 2005, 2009, 2012, 2013, 2017, 2020
Mechanical Engineering 512 (Heat Transfer and Fluid Mechanics Laboratory), 2000, 2001
Aerospace Engineering 3570 (Gas Dynamics), 2018
Aerospace Engineering 550 / 4550 (Introduction to Jet Propulsion), 2001-2005, 2014-2016, 2019
Mechanical Engineering 581 (Senior Fluids/Thermo Design Project), 2004-2011

<u>*Graduate:*</u>
Mechanical Engineering 701 (Gas Dynamics), 1998, 2003, 2004
Mechanical Engineering 702 (Advanced Engineering Thermodynamics), 2006, 2007
Mechanical Engineering 7510 (Advanced Heat Transfer), 2014
Mechanical Engineering 8503 (Statistical Thermodynamics), 2013, 2015, 2017, 2019
Mechanical Engineering 804 / 8504 (Physical Gas Dynamics), 2008, 2010, 2012, 2014, 2016, 2020
Mechanical Engineering 805 / 8504 (Plasmas and Gas Discharges), 2004, 2008, 2010, 2014, 2016, 2020
Aerospace Engineering 805 (Aerodynamics of Chemically Reacting Fluids), 2001

Undergraduate Fluids / Thermo / Heat Transfer Laboratory Course Development:
Mechanical Engineering 512 (Heat Transfer and Thermodynamics labs), 2010

Students advised:

15 M.S. students - Rodney Meyer (graduated Wi 2004), Naveen Chintala (graduated Su 2004), Paul Shawcross (graduated Sp 2005), Seth Norberg (graduated Sp 2005), Matt Goshe (graduated Au 2005), Adam Hicks (graduated Wi 2006), John Bruzzese (graduated Su 2008), Joe Heinrichs (BS/MS, graduated Su 2012), Zak Eckert (graduated Sp 2015), Yi-Chen Hung (graduated Su 2016), Matt Yurkovich (graduated Au 2016), Ilya Gulko (graduated Su 2020), Caleb Richards, and David Mignogna

17 Ph.D. students - Munetake Nishihara (graduated Au 2006), Allen White (graduated Su 2007), Ainan Bao (graduated Au 2007), Saurabh Keshav (graduated Su 2008), John Bruzzese (graduated Spring 2011), Ashim Dutta (graduated Summer 2011), Zhiyao Yin (graduated Su 2013), Ting Li (graduated Au 2014), Andrew Roettgen (graduated Sp 2015), Jacob Schmidt (graduated Su 2015), Ben Goldberg (graduated Au 2015), Vitaly Petrishchev (graduated Su 2016), Caroline Winters (graduated Su 2017), Zak Eckert (graduated Au 2017), Yi-Chen Hung (graduated Su 2018), Elijah Jans, Keegan Orr, and Sai Raskar

Post-Doctoral Researchers:

1. Dr. Yurii Utkin (Ph.D., St. Petersburg State University, Russia) – 2003-2006
2. Dr. Guofeng Lou (Ph.D., Tokyo Institute of Technology, Japan) – 2004-2006
3. Dr. Munetake Nishihara (Ph.D., Ohio State University) – 2007-2014
4. Dr. Evgeny Mintusov (Ph.D., Moscow Institute of Physics of Technology) – 2007-2008
5. Dr. Anna Serdyuchenko (Ph.D., Ruhr University Bochum, Germany) – 2007-2008
6. Dr. Keisuke Takashima (Ph.D., Tokyo Institute of Technology) – 2009-2011
7. Dr. Evgeny Ivanov (Grodno State University, Belarus) – 2009-2013
8. Dr. Ivan Shkurenkov (Moscow State University, Moscow) – 2012-2015
9. Dr. Zhiyao Yin (Ph.D., Ohio State University) – 2013-2014
10. Dr. Ben Goldberg (Ph.D., Ohio State University) – 2016
11. Dr. Marien Simeni Simeni (Ph.D., Ecole Centrale Paris, France) – 2015-2018
12. Dr. Dirk van den Bekerom (Ph.D. Eindhoven University of Technology, Netherlands) – 2018-current
13. Dr. Anam Paul (Ph.D. University of Louisville) – 2020-current

Visiting Scholars:

1. Prof. Josef Stricker (Technion University, Haifa, Israel), 2006
2. Dr. Alexander Erofeev (Ioffe Physico-Technical Institute, St. Petersburg, Russia), 2007
3. Keisuke Udagawa (Ph.D. student, Tokyo Institute of Technology, Tokyo, Japan), 2007
4. Prof. Sergey Leonov (Joint Institute for High Temperatures, Moscow, Russia), 2010, 2011, 2012
5. Andrei Klochko (Ph.D. student, Ecole Polytechnique, Paris, France), 2012
6. Prof. Hidemasa Takana (Tohoku University, Sendai, Japan), 2012, 2016
7. Dr. Cheng Zhang (Chinese Academy of Sciences, Beijing, China), 2015-2016
8. Andrei Chernukho (Advanced Research and Technologies, Minsk, Belarus), 2015
9. Edmond Baratte (M.S. student, Ecole Polytechnique, Paris, France), 2017
10. Dirk van den Bekerom (Ph.D. student, Dutch Institute for Fundamental Energy Research, Eindhoven, Netherlands), 2017
11. Tang Yong (Ph.D. student, Tsinghua University, Beijing, China), 2018-2019
12. Dr. Zhongwei Liu (Beijing Institute of Graphic Communication), 2018-2019
13. Xin Yang (Ph.D. student, Xian Jiaotong University, Xian, China), 2019-2021

Professional Activities:

Editor-in-Chief: Plasma Sources Science and Technology, 2020-current

Associate Editor: Plasma Sources Science and Technology, 2015-2020

Editorial Board Member: Plasma Sources Science and Technology, 2013-current

International Scientific Committee, International Conference on Phenomena in Ionized Gases (ICPIG), 2017-2023

Technical Committee Member, AIAA Plasmadynamics and Lasers, 2000-2018

Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA)

Honors and Awards:

2020, AIAA Plasmadynamics and Lasers Technical Committee 2020 Best Student Paper Award:
E.R. Jans, I. Gulko, X. Yang, T.A. Miller, and I.V. Adamovich, "Complementary Laser Diagnostics of Metastable $N_2(A^3\Sigma_u^+,v)$ Molecules in Nonequilibrium Plasmas and in High-Speed Flows", AIAA Paper 2020-1743, 2020 AIAA Aerospace Sciences Meeting (SciTech 2020), 6-10 January 2020, Orlando, FL

2018, Gaspard Monge Visiting Professor, Laboratory of Plasma Physics, Ecole Polytechnique, Paris, France

2018, AIAA Plasmadynamics and Lasers Technical Committee 2018 Best Paper Award:
C. Winters, Z. Eckert, Z. Yin, K. Frederickson, and I.V Adamovich, "Measurements and Kinetic Modeling of H and O Atoms in Fuel-Oxidizer Mixtures Excited by a Burst of Nanosecond Pulse Discharge", AIAA Paper 2018-1194, 2018 AIAA Aerospace Sciences Meeting, 8-12 January 2018, Kissimmee, FL

2017, AIAA Plasmadynamics and Lasers Technical Committee 2017 Best Student Paper Award:
C. Winters, Y.-C. Hung, E. Jans, K. Frederickson, and I.V. Adamovich, "OH Radical Measurements in Hydrogen-Air Mixtures at the Conditions of Strong Vibrational Nonequilibrium", AIAA Paper 2017-1584, 2017 AIAA Aerospace Sciences Meeting (SciTech 2017), 9-13 January 2017, Grapevine, TX

2015, AIAA Plasmadynamics and Lasers Technical Committee 2015 Best Paper Award:
B.M. Goldberg, I. Shkurenkov, S. O'Byrne, I.V. Adamovich, and W.R. Lempert, "Electric Field Measurements in a Dielectric Barrier Nanosecond Pulse Discharge with Sub-nanosecond Time Resolution", AIAA Paper 2015-0935, 53rd AIAA Aerospace Sciences Meeting (SciTech 2015), 5-9 January 2015, Kissimmee, Florida

2015, Distinguished Paper, New Technology Colloquium, 35th International Symposium on Combustion:
Z. Yin, Z. Eckert, I.V. Adamovich, and W.R. Lempert, "Time-resolved radical species and temperature distributions in an Ar-O_2-H_2 mixture excited by a nanosecond pulse discharge", Proceedings of the Combustion Institute, vol. 35, 2015

2013, Distinguished Paper, New Technology Colloquium, 34th International Symposium on Combustion:
Z. Yin, I.V. Adamovich, and W.R. Lempert, "OH Radical and Temperature Measurements During Ignition of H_2-Air Mixtures Excited by a Repetitively Pulsed Nanosecond Discharge", Proceedings of the Combustion Institute, vol. 34, 2013, pp. 3249–3258

2011, JSPS (Japan Society for Promotion of Science) Invitation Fellowship

2011, OSU College of Engineering Lumley Research Award

2006, OSU College of Engineering Lumley Research Award

2005, AIAA Plasmadynamics and Lasers Technical Committee 2004 Best Paper Award:
W. Lee, K. Frederickson, P. Palm, I. Adamovich, J.W. Rich, and W. Lempert, "Mitigation of Oxygen Attachment in High Pressure Air Plasmas by Vibrational Excitation", AIAA Paper 2004-2257, 35th Plasmadynamics and Lasers Conference, Portland, OR, 29 June – 1 July 2004

1997, AIAA Plasmadynamics and Lasers Technical Committee 1996 Best Paper Award:
I.V. Adamovich, J.W. Rich, and G.L. Nelson, "Feasibility Study of Magnetohydrodynamics Acceleration of Unseeded and Seeded Air Flows", AIAA Paper 96-2347, 27th AIAA Plasmadynamics and Lasers Conference, June 1996, New Orleans, LA

Patents:

M. Samimy and I. Adamovich, “Localized Arc Filament Plasma Actuators for Noise Mitigation and Mixing Enhancement”, U.S. Patent 7,334,394, February 26, 2008

M. Samimy and I. Adamovich, “Localized Arc Filament Plasma Actuators for Noise Mitigation and Mixing Enhancement”, U.S. Patent 7,669,404, March 2, 2010

Publications: over 150 archival journal papers and book sections, over 300 conference presentations, over 90 invited talks at national and international meetings, invited lectures, and seminars.

Citation indices: over 4,000 citations, h-index: 38 (*Web of Science*)
over 7,000 citations, h-index: 49 (*Scopus*)
over 9,000 citations, h-index: 55 (*Google Scholar*)

Publications: Archival Journal Papers and Book Sections

1.1. I.V. Adamovich, P.A. Apanasevich, V.I. Borodin, S.A. Zhdanok et al., "CARS Diagnostics of High-Voltage Atmospheric Pressure Discharge in Nitrogen", Springer Proceedings in Physics, vol. 63, **"Coherent Raman Spectroscopy"**, Eds. G. Marowsky and V.V. Smirnov, Springer, Berlin, 1992, pp. 215-223

1.2. I. Adamovich, S. Saupe, M.J. Grassi, O. Shulz, S. Macheret and J.W. Rich, "Vibrationally Stimulated Ionization of Carbon Monoxide in Optical Pumping Experiments", **Chemical Physics**, vol. 173, 1993, pp. 491-504

1.3. S. Saupe, I. Adamovich, M.J. Grassi and J.W. Rich, "Vibrational and Electronic Excitation of Nitric Oxide in Optical Pumping Experiments", **Chemical Physics**, vol. 174, 1993, pp. 219-228

1.4. I.V. Adamovich, S.O. Macheret, and J.W. Rich, "Spatial Nonhomogeneity Effects in Nonequilibrium Vibrational Kinetics", **Chemical Physics**, vol. 182, 1994, pp. 167-183

1.5. I.V. Adamovich, S.O. Macheret, J.W. Rich and C.E. Treanor, "Vibrational Relaxation and Dissociation behind Strong Shock Waves. I. Kinetic Rate Models", **AIAA Journal**, vol. 33, No. 6, 1995, pp. 1064-1069

1.6. I.V. Adamovich, S.O. Macheret, J.W. Rich and C.E. Treanor, "Vibrational Relaxation and Dissociation behind Strong Shock Waves. II. Master Equation Modeling", **AIAA Journal**, vol. 33, No. 6, 1995, pp. 1070-1075

1.7. J.W. Rich, S.O. Macheret, and I.V. Adamovich, "Aerothermodynamics of Vibrationally Nonequilibrium Gas", **Experimental Thermal and Fluid Science**, vol. 13, 1996, pp. 1-10

1.8. C.E. Treanor, I.V. Adamovich, M.J. Williams, and J.W. Rich, "Kinetics of NO Formation Behind Strong Shock Waves", **Journal of Thermophysics and Heat Transfer**, vol. 10, No. 2, 1996, pp. 193-199

1.9. I.V. Adamovich, S.O. Macheret, J.W. Rich, C.E. Treanor, and A.A. Fridman, “Vibrational Relaxation, Nonequilibrium Chemical Reactions, and Kinetics of NO Formation Behind Strong Shock Waves”, in M. Capitelli (ed.) **“Molecular Physics and Hypersonic Flows”**, NATO Advanced Study Institute Series, vol. 482, Kluwer, 1996, p. 85-104

1.10. I.V. Adamovich, S.O. Macheret, and J.W. Rich, “Existence of the Bottleneck in Vibrational Relaxation of Diatomic Molecules”, **Journal of Thermophysics and Heat Transfer**, vol. 11, No. 2, 1997, pp. 261-265

1.11. I.V. Adamovich and J.W. Rich, “The Effect of Superelastic Electron-Molecule Collisions on the Vibrational Energy Distribution Function”, **Journal of Physics D: Applied Physics**, vol. 30, No. 12, 1997, pp. 1741-1745

1.12. I.V. Adamovich, S.O. Macheret, J.W. Rich and C.E. Treanor, "Vibrational Energy Transfer Rates Using a Forced Harmonic Oscillator Model", **Journal of Thermophysics and Heat Transfer**, vol. 12, No. 1, 1998, pp. 57-65

1.13. I.V. Adamovich, J.W. Rich, and G.L. Nelson, "Feasibility Study of Magneto-hydrodynamics Acceleration of Unseeded and Seeded Air Flows", **AIAA Journal**, vol. 36, No. 4, 1998, pp. 590-597

1.14. I.V. Adamovich, V.V. Subramaniam, J.W. Rich, and S.O. Macheret, "Phenomenological Analysis of Shock Wave Propagation in Weakly Ionized Plasmas", **AIAA Journal**, vol. 36, No.5, 1998, pp. 816-822

1.15. I.V. Adamovich and J.W. Rich, "Three-Dimensional Nonperturbative Analytic Model of Vibrational Energy Transfer in Atom-Molecule Collisions", **Journal of Chemical Physics**, vol. 109, No. 18, 1998, pp. 7711-7724

1.16. Yano, R., Contini, V., Ploenjes, E., Palm, P., Merriman, S., Aithal, S., Adamovich, I., Lempert. W., Subramaniam. V., and Rich, J.W., "Supersonic Nonequilibrium Plasma Wind Tunnel Measurements of Shock Modification and Flow Visualization", **AIAA Journal**, vol. 38, No. 10, 2000, pp. 1879-1888

1.17. E. Ploenjes, P. Palm, A.P. Chernukho, I.V. Adamovich, and J.W. Rich, "Time-Resolved Fourier Transform Infrared Spectroscopy of Optically Pumped Carbon Monoxide", **Chemical Physics**, vol. 256, 2000, pp. 315-331

1.18. S.O. Macheret and I.V. Adamovich, "Semiclassical Modeling of State-Specific Dissociation Rates in Diatomic Gases", **Journal of Chemical Physics**, vol. 113, No. 17, 2000, pp. 7351-7361

1.19. E. Ploenjes, P. Palm, I.V. Adamovich, and J.W. Rich, "Ionization Measurements in Optically Pumped Discharges", **Journal of Physics D: Applied Physics**, vol. 33, No. 16, 2000, pp. 2049-2056

1.20. E. Ploenjes, P. Palm, W. Lee, M. D. Chidley, I.V. Adamovich, W.R. Lempert, and J. William Rich, "Vibrational Energy Storage in High-Pressure Mixtures of Diatomic Molecules", **Chemical Physics**, vol. 260, 2000, pp. 353-366

1.21. W. Lee, I.V. Adamovich, and W.R. Lempert, "Optical Pumping Studies of Vibrational Energy Transfer in High-Pressure Diatomic Gases", **Journal of Chemical Physics**, vol. 114, No. 3, 2001, pp. 1178-1186

1.22. I.V. Adamovich, "Control of Electron Recombination Rate and Electron Density in Optically Pumped Nonequilibrium Plasmas", **Journal of Physics D: Applied Physics**, vol. 34, 2001, pp. 319-325

1.23. S. Merriman, E. Plönjes, P. Palm, and I.V. Adamovich "Shock Wave Control by Nonequilibrium Plasmas in Cold Supersonic Gas Flows", **AIAA Journal**, vol. 39, No. 8, 2001, pp. 1547-1552

1.24. P. Palm, E. Plönjes, M. Buoni, V.V. Subramaniam, and I.V. Adamovich, "Electron Density and Recombination Rate Measurements in CO-Seeded Optically Pumped Plasmas", **Journal of Applied Physics**, vol. 89, No. 11, 2001, pp. 5903-5910

1.25. E. Plönjes, P. Palm, W. Lee, W.R. Lempert, and I.V. Adamovich, "RF Energy Coupling to High-Pressure Optically Pumped Nonequilibrium Plasmas", **Journal of Applied Physics**, vol. 89, No. 11, 2001, pp. 5911-5918

1.26. I.V. Adamovich, "Three-Dimensional Model of Vibrational Energy Transfer in Molecule-Molecule Collisions", **AIAA Journal**, vol. 39, No. 10, 2001, pp. 1916-1925

1.27. A.R. White, P. Palm, E. Plönjes, V.V. Subramaniam, and I.V. Adamovich, "Effect of Electron Density on Shock Wave Propagation in Optically Pumped Plasmas", **Journal of Applied Physics**, vol. 91, No. 5, 2002, pp. 2604-2610

1.28. E. Plönjes, P. Palm, G.B. Viswanathan, V.V. Subramaniam, I.V. Adamovich, W.R. Lempert, H.L. Fraser, and J.W. Rich, "Synthesis of Single-Walled Carbon Nanotubes in Vibrationally

Nonequilibrium Carbon Monoxide", **Chemical Physics Letters**, vol. 352, No. 5-6, 2002, pp. 342-347

1.29. E. Plönjes, P. Palm, J.W. Rich, I.V. Adamovich, and W. Urban, "Electron-Mediated Vibration-Electronic (V-E) Energy Transfer in Optically Pumped Plasmas", **Chemical Physics**, vol. 279, 2002, pp. 43-54

1.30. G.V. Candler, J.D. Kelley, S.O. Macheret, M.N. Shneider, and I.V. Adamovich, "Vibrational Excitation, Thermal Nonuniformities, and Unsteady Effects on Supersonic Blunt Bodies", **AIAA Journal**, vol. 40, No. 9, 2002, pp. 1803-1810

1.31. P. Palm, R. Meyer, E. Ploenjes, J.W. Rich, and I.V. Adamovich, "Nonequilibrium Radio Frequency Discharge Plasma Effect on a Conical Shock Wave: M=2.5 Flow", **AIAA Journal**, vol. 41, No. 5, 2003, pp. 465-469

1.32. T. Ahn, I.V. Adamovich, and W.R. Lempert, "Determination of Nitrogen V-V Transfer Rates by Stimulated Raman Pumping", **Chemical Physics**, vol. 298, 2004, pp. 233-240

1.33. M. Samimy, I. Adamovich, B. Webb, J. Kastner, J. Hileman, S. Keshav, and P. Palm, "Development and Characterization of Plasma Actuators for High Speed Jet Control", **Experiments in Fluids**, vol. 37, No. 4, 2004, pp. 577-588

1.34. N. Chintala, R. Meyer, A. Hicks, A. Bao, J.W. Rich, W.R. Lempert, and I.V. Adamovich, "Non-Thermal Ignition of Premixed Hydrocarbon-Air Flows by Nonequilibrium RF Plasma", **Journal of Propulsion and Power**, vol. 21, No. 4, 2005, pp. 583-590

1.35. Yu.G. Utkin, I.V. Adamovich, and J.W. Rich, "Time-Resolved Measurements of Ionization and Vibration-to-Electronic Energy Transfer in Optically Pumped Plasmas", **Journal of Physics D: Applied Physics**, vol. 38, 2005, pp. 688-696

1.36. J. Scharer, W. Rich, I. Adamovich, W. Lempert, K. Akhtar, C. Laux, S. Kuo, C. Kruger, R. Vidmar, and R.J. Barker, "High Frequency Air Plasmas", in **"Non-Equilibrium Air Plasmas at Atmospheric Pressure"**, K.H. Becker, U. Kogelschatz, K.H. Schoenbach, and R.J. Barker (eds.), Institute of Physics Publishing, Bristol, 2005, Chap. 7, pp. 362-445

1.37. R. Meyer, M. Nishihara, A. Hicks, N. Chintala, M. Cundy, W.R. Lempert, I.V. Adamovich, and S. Gogineni, "Measurements of Flow Conductivity and Density Fluctuations in Supersonic Nonequilibrium MHD Flows", **AIAA Journal**, vol. 43, No. 9, 2005, pp. 1923-1930

1.38. M. Nishihara, N. Jiang, J.W. Rich, W.R. Lempert, I.V. Adamovich, and S. Gogineni, "Low-Temperature Supersonic Boundary Layer Control Using Repetitively Pulsed MHD Forcing", **Physics of Fluids**, vol. 17, No. 10, 2005, p. 106102

1.39. A. Hicks, S. Norberg, P. Shawcross, W.R. Lempert, J.W. Rich, and I.V. Adamovich, "Singlet Oxygen Generation in a High Pressure Non-Self-Sustained Electric Discharge", **Journal of Physics D: Applied Physics**, vol. 38, 2005, pp. 3812-3824

1.40. N. Chintala, A. Bao, G. Lou, and I.V. Adamovich, "Measurements of Combustion Efficiency in Nonequilibrium RF Plasma Ignited Flows", **Combustion and Flame**, vol. 144, No. 4, 2006, pp. 744-756

1.41. T. Ahn, I. Adamovich**,** and W.R. Lempert**, "**Stimulated Raman Scattering Measurements of V-V Transfer in Oxygen", **Chemical Physics**, vol. 323, 2006, pp. 532-544

1.42. Y.G. Utkin, M. Goshe, I.V. Adamovich, and J.W. Rich, "Compact High Overtone Band Carbon Monoxide Laser", **Optics Communications**, vol. 263, 2006, pp. 105-110

1.43. M. Nishihara, J.W. Rich, W.R. Lempert, I.V. Adamovich, and S. Gogineni, "Low-Temperature M=3 Flow Deceleration by Lorentz Force", **Physics of Fluids**, vol. 18, No. 8, 2006, p. 086101

1.44. K.A. Essenhigh, Y.G. Utkin, C. Bernard, I.V. Adamovich, and J.W. Rich, "Gas Phase Boudouard Disproportionation Reaction between Highly Vibrationally Excited CO Molecules", **Chemical Physics**, vol. 330, 2006, pp. 506-514

1.45. A. Hicks, Yu.G. Utkin, W.R. Lempert, J.W. Rich, and I.V. Adamovich, “Continuous Wave Operation of a Non-Self-Sustained Electric Discharge Pumped Oxygen-Iodine Laser”, **Applied Physics Letters**, vol. 89, 2006, p. 241131

1.46. G. Lou, A. Bao, M. Nishihara, S. Keshav, Y.G. Utkin, J.W. Rich, W.R. Lempert, and I.V. Adamovich, “Ignition of Premixed Hydrocarbon-Air Flows by Repetitively Pulsed, Nanosecond Pulse Duration Plasma”, **Proceedings of the Combustion Institute,** vol. 31, 2007, pp. 3327-3334

1.47. Y.G. Utkin, S. Keshav, J.-H. Kim, J. Kastner, I.V. Adamovich, and M. Samimy, “Development and Use of Localized Arc Filament Plasma Actuators For High-speed Flow Control”, **Journal of Physics D: Applied Physics**, vol. 40, 2007, pp. 685-694

1.48. M. Samimy, J.-H. Kim, J. Kastner, I. Adamovich, and Y. Utkin, “Active Control of High-speed and High Reynolds Number Jets Using Plasma Actuators”, **Journal of Fluid Mechanics**, vol. 578, 2007, pp. 305-330

1.49. M. Samimy, J.-H. Kim, J. Kastner, I. Adamovich, and Y. Utkin, “Active Control of a Mach 0.9 High Reynolds Number Jet for Noise Mitigation Using Plasma Actuators”, **AIAA Journal**, vol. 45, No. 4, 2007, pp. 890-901

1.50. A. Hicks, S. Tirupathi, N. Jiang, Yu. Utkin, W.R. Lempert, J.W. Rich, and I.V. Adamovich, “Design and Operation of a Supersonic Flow Cavity for a Non-Self-Sustained Electric Discharge Pumped Oxygen-Iodine Laser”, **Journal of Physics D: Applied Physics**, vol. 40, 2007, pp. 1408-1415

1.51. K. Frederickson, W. Lee, P. Palm, I.V. Adamovich, J.W. Rich, and W.R. Lempert, "Mitigation of Electron Attachment to Oxygen in High Pressure Air Plasmas by Vibrational Excitation", **Journal of Applied Physics**, vol. 101, 2007, p. 093302

1.52. T. Ahn, I. Adamovich**,** and W.R. Lempert**, “**Stimulated Raman Scattering Measurements of H_2 Vibration-Vibration Transfer”, **Chemical Physics**, vol. 335, 2007, pp. 55-68

1.53. I.V. Adamovich and J.W. Rich, “Emission and Shock Visualization in Nonequilibrium Nitrogen Afterglow Plasma”, **Journal of Applied Physics**, vol. 102, 2007, p. 083303

1.54. M. Nishihara and I.V. Adamovich, “Numerical Simulation of a Crossed Pulser-Sustainer Discharge in Transverse Magnetic Field”, **IEEE Transactions on Plasma Science**, vol. 35, No.5, 2007, pp. 1312-1324

1.55. A. Hicks, J. Bruzzese, W.R. Lempert, J.W. Rich, and I.V. Adamovich, “Effect of Nitric Oxide on Gain and Output Power of a Non-Self-Sustained Electric Discharge Pumped Oxygen-Iodine Laser”, **Applied Physics Letters**, vol. 91, 2007, p. 071116

1.56. A. Bao, Yu.G. Utkin, S. Keshav, G. Lou, and I.V. Adamovich, “Ignition of Ethylene-Air and Methane-Air Flows by Low-Temperature Repetitively Pulsed Nanosecond Discharge Plasma”, **IEEE Transactions on Plasma Science**, vol. 35, 2007, pp. 1628-1638

1.57. S. Keshav, Y.G. Utkin, M. Nishihara, A. Bao, J.W. Rich, and I.V. Adamovich, “Studies of Chemi-Ionization and Chemiluminescence in Supersonic Flows of Combustion Products”, **Journal of Thermophysics and Heat Transfer**, vol. 22, No. 2, 2008, pp. 157-167

1.58. I.V. Adamovich, W.R. Lempert, J.W. Rich, and Y.G. Utkin, “Repetitively Pulsed Nonequilibrium Plasmas for Magnetohydrodynamic Flow Control and Plasma-Assisted Combustion”, **Journal of Propulsion and Power**, vol. 24, No. 6, 2008, pp. 1198-1215

1.59. E. Mintusov, A. Serdyuchenko, I. Choi, W.R. Lempert, and I.V. Adamovich, “Mechanism of Plasma Assisted Oxidation and Ignition of Ethylene-Air Flows by a Repetitively Pulsed Nanosecond Discharge”, **Proceedings of the Combustion Institute**, vol. 32, 2009, pp. 3181-3188

1.60. M. Uddi, N. Jiang, E. Mintusov, I.V. Adamovich, and W.R. Lempert, “Atomic Oxygen Measurements in Air and Air/Fuel Nanosecond Pulse Discharges by Two Photon Laser Induced Fluorescence”, **Proceedings of the Combustion Institute**, vol. 32, 2009, pp. 929-936

1.61. G. Lou, W. Lee, W.R. Lempert, I.V. Adamovich, and W.J. Rich, “Temperature and Vibrational Distribution Function in High-Pressure Diatomic Gas Mixture”, **Journal of Physics D: Applied Physics**, vol. 42, 2009, p. 055508

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2.3. I.V. Adamovich, V.V. Subramaniam, J.W. Rich, and S.O. Macheret, "Shock Wave Propagation in Weakly Ionized Plasmas", AIAA Paper 97-2499 (invited), presented at 32nd Thermophysics Conference, June 1997, Atlanta, GA

2.4. E. Plönjes, I. Adamovich, J.W. Rich, P. Palm, W. Urban, and A.P. Chernukho, "Molecular Energy Transfer in Nonequilibrium Fluids", AIAA Paper 97-2531 (invited), 32nd Thermophysics Conference, June 1997, Atlanta, GA

2.5. I.V. Adamovich, S. Aithal, P. Palm, E. Plönjes, V.V. Subramaniam, R. Yano, and J.W. Rich, "Modeling of Vibration-to-Vibration and Vibration-to-Electronic Energy Transfer Processes in Nonequilibrium flows", AIAA Paper 98-2750 (invited), 29th Plasmadynamics and Lasers Conference, June 1998, Albuquerque, NM

2.6. I.V. Adamovich and J.W. Rich, "Three-Dimensional Nonperturbative Analytic Model of Vibrational Energy Transfer in Molecule-Molecule Collisions", AIAA Paper 99-3565 (invited), presented at AIAA 33th Thermophysics Conference, Norfolk, VA, June 28 – July 1, 1999

2.7. S.O. Macheret, P.F. Barker, K. Waichman, R.B. Miles, E.Ploenjes, P. Palm, I.V. Adamovich, W.R. Lempert, and J.W. Rich, "Optically Pumped and Controlled Electric Discharges", AIAA Paper 99-3636 (invited), AIAA 33th Thermophysics Conference, Norfolk, VA, June 28 – July 1, 1999

2.8. I.V. Adamovich, "Studies of Molecular Energy Transfer in Optically Pumped Plasmas", OSU Physical Chemistry Seminar, January 24, 2000

2.9. I.V. Adamovich, "Studies of High-Pressure Nonequilibrium Plasma for Supersonic Flow Control, Plasma Chemical Synthesis, and Material Processing", seminar at the Department of Aerospace Engineering, University of Arizona, February 23, 2000

2.10. I.V. Adamovich, "Studies of High-Pressure Nonequilibrium Plasma for Supersonic Flow Control, Plasma Chemical Synthesis, and Material Processing", seminar at the Department of Mechanical Engineering, Vanderbilt University, April 5, 2000

2.11. I.V. Adamovich, S. Merriman, E. Ploenjes, and P. Palm, "Shock Wave Control by Nonequilibrium Plasmas in Cold Supersonic Gas Flows", AIAA Paper 2000-2327 (invited), presented at a special session on high-speed flow control, AIAA Fluids 2000 Conference, Denver, CO, June 19-22, 2000

2.12. I.V. Adamovich, “Studies of High-Pressure Nonequilibrium Plasma for Supersonic Flow Control, Plasma Chemical Synthesis, and Material Processing”, seminar at the Department of Mechanical Engineering, University of Tennessee at Knoxville, February 20, 2001
2.13. I.V. Adamovich, “Studies of High-Pressure Nonequilibrium Plasma for Supersonic Flow Control, Plasma Chemical Synthesis, and Material Processing”, seminar at the Department of Aerospace Engineering, University of Illinois at Urbana-Champaign, April 12, 2001
2.14. I. V. Adamovich, “Nonequilibrium Plasma and MHD Methods for Supersonic Flow Control and Plasma Material Processing”, seminar at the Department of Aerospace Engineering and Aviation, Ohio State University, April 19, 2001
2.15. I.V. Adamovich, “High Speed Flow Control and Combustion Control by Nonequilibrium Plasmas / MHD”, seminar at Tokyo Institute of Technology, November 2003
2.16. I.V. Adamovich, W.R. Lempert, V.V. Subramaniam, and J.W. Rich, “Physics of Fluid Flows and Aerodynamic Plasmas with Thermal Mode Nonequilibrium”, invited lecture at International Symposium on Energy Conversion Fundamentals, Istanbul, Turkey, June 21-25, 2004
2.17. A. Hicks, S. Norberg, P. Shawcross, W.R. Lempert, J.W. Rich, and I.V. Adamovich, “Development of a Non-Self-Sustained Electric Discharge Pumped Oxygen-Iodine Laser”, AIAA Paper 2005-4916 (invited), 36th Plasmadynamics and Lasers Conference, Toronto, ON, 6-9 June 2005
2.18. I. Adamovich, W. Lempert, Yu. Utkin, and J.W. Rich, “Thermal Mode Nonequilibrium in High Speed Gas Dynamics”, AIAA Paper 2006-0584 (invited), 44th Aerospace Sciences Meeting and Exhibit, January 2006, Reno, NV
2.19. M. Samimy, J.-H. Kim, I. Adamovich, Y. Utkin, and J. Kastner, “Active Control of High Speed and High Reynolds Number Free Jets Using Plasma Actuators”, AIAA Paper 2006-0711 (invited), presented at the S.M. Bogdonoff memorial session, 44th Aerospace Sciences Meeting and Exhibit, January 2006, Reno, NV
2.20. I.V. Adamovich, W.R. Lempert, and J. W. Rich, “Repetitively Pulsed Nonequilibrium Plasmas for Plasma-Assisted Combustion, Flow Control, and Molecular Lasers”, invited talk at 59th Gaseous Electronics Conference, October 10-13, 2006, Columbus, OH
2.21. I.V. Adamovich, W.R. Lempert, and J. W. Rich, “Repetitively Pulsed Nonequilibrium Plasmas for Plasma-Assisted Combustion, High-Speed Flow Control, and Molecular Lasers”, invited lecture at the Aerospace Thematic Workshop “Fundamentals of Aerodynamic Flow and Combustion Control by Plasmas”, May 28-31, 2007, Varenna, Italy
2.22. I.V. Adamovich, “Nonequilibrium Gas Dynamics: Understanding of High-Speed Flows at Strong Energy Mode Disequilibrium”, seminar at the Department of Aerospace Engineering, Ohio State University, January 28, 2008
2.23. J. Bruzzese, M. Nishihara, A. Hicks, W.R. Lempert, J.W. Rich, and I.V. Adamovich, “Optimization and Scaling of a Pulser-Sustainer Discharge Excited Oxygen-Iodine Laser”, Paper 7005-53 (invited), SPIE High Power Laser Ablation Conference, 20 - 24 April 2008, Taos, NM
2.24. I.V. Adamovich, W.R. Lempert, J.W. Rich, and M. Samimy, “Experimental Studies of High-Speed Flow Control and Ignition by Nonequilibrium Plasmas”, invited lecture at 19th Europhysics Conference on the Atomic and Molecular Physics of Ionized Gases (ESCAMPIG XIX), 15-19 July 2008, Granada, Spain
2.25. I.V. Adamovich, W.R. Lempert, J.W. Rich, and M. Samimy, “Repetitively Pulsed Plasmas for Plasma Assisted Combustion, Flow Control, and Molecular Lasers: Non-Thermal and Thermal Effects”, invited lecture at the 3rd International Workshop on Nonequilibrium Processes in Combustion and Plasma Based Technologies”, Minsk, Belarus, August 23-28, 2008
2.26. M. Nishihara, K. Takashima, N, Jiang, W.R. Lempert, J.W. Rich, I.V. Adamovich, S. Doraiswamy, and G. Candler, “High Speed Flow Characterization and Flow Control in Nonequilibrium Plasma Wind Tunnels”, invited lecture at the 17th International Conference on MHD Energy Conversion, 14-17 September 2009, Kanagawa, Japan

2.27. I.V. Adamovich, W.R. Lempert, J.W. Rich, and M. Samimy, "Nanosecond Pulse Discharges for High Speed Flow Control and Plasma Assisted Combustion", invited talk at the Gordon Research Conference "Plasma Processing Science and Societal Grand Challenges", July 11-16, 2010, Colby-Sawyer College, New London, NH
2.28. I.V. Adamovich, W.R. Lempert, J.W. Rich, and M. Samimy, "Nanosecond Pulse Discharges for High Speed Flow Control and Plasma Assisted Combustion", seminar at Beijing University of Science and Technology, August 3, 2010, Beijing, China
2.29. I.V. Adamovich, W.R. Lempert, J.W. Rich, and M. Samimy, "Nanosecond Pulse Discharges for Plasma Assisted Combustion and High Speed Flow Control", seminar at Tsinghua University, August 4, 2010, Beijing, China
2.30. I.V. Adamovich, W.R. Lempert, J.W. Rich, and M. Samimy, "Nanosecond Pulse Discharges for High Speed Flow Control and Plasma Assisted Combustion", seminar at the Department of Physics and Astronomy, Ruhr University Bochum, November 12, 2010, Bochum, Germany
2.31. I.V. Adamovich and K. Takashima, "Fast Ionization Wave Discharges: Experiments and Modeling", seminar at the Department of Physics and Astronomy, Ruhr University Bochum, November 19, 2010, Bochum, Germany
2.32. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", invited lecture at the Aerospace Thematic Workshop "Fundamentals of Aerodynamic Flow and Combustion Control by Plasmas", March 28 – April 1, 2011, Les Houches – Mont Blanc, France
2.33. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", seminar at the Department of Energy Sciences, Tokyo Institute of Technology, April 22, 2011, Tokyo, Japan
2.34. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", seminar at the Department of Engineering Mechanics and Energy, University of Tsukuba, April 29, 2011, Tsukuba, Japan
2.35. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Experimental and Modeling Studies of Fast Ionization Wave Discharges", seminar at the Department of Energy Sciences, Tokyo Institute of Technology, May 17, 2011, Tokyo, Japan
2.36. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", seminar at the Institute of Fluids Science, Tohoku University, May 18, 2011, Sendai, Japan
2.37. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", seminar at the Department of Electrical Engineering, Nagaoka University of Technology, May 20, 2011, Nagaoka, Japan
2.38. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", seminar at the Department of Mechanical and Aerospace Engineering, University of Nagoya, May 31, 2011, Nagoya, Japan
2.39. I.V. Adamovich, "Kinetics and Plasma Chemistry of Nanosecond Pulse Discharges and Fast Ionization Wave Discharges", invited lecture at the 20th International Symposium on Plasma Chemistry (ISPC), Philadelphia, PA, July 24 - 29, 2011
2.40. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", seminar at the Department of Aerospace and Mechanical Engineering, University of Notre Dame, September 13**,** 2011
2.41. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Nanosecond Pulse Discharges For Plasma Assisted Combustion and High Speed Flow Control", seminar at the Michigan Institute of Plasma Science and Engineering (MIPSE), University of Michigan, September 14**,** 2011
2.42. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, "Energy Efficient Applications of Nanosecond Pulse Discharges: Plasma Assisted Combustion and High Speed Flow Control",

seminar at the Department of Mechanical Engineering, University of Minnesota, September 21, 2011

2.43. I.V. Adamovich, W.R. Lempert, J. W. Rich, and M. Samimy, “Energy Efficient Applications of Nanosecond Pulse Discharges: Plasma Assisted Combustion and High Speed Flow Control”, Fluid Mechanics seminar at University of Illinois at Urbana-Champaign, October 7, 2011

2.44. K. Takashima and I.V. Adamovich, “Nanosecond Pulse Discharges and Fast Ionization Wave Discharges: Fundamental Kinetic Processes and Applications”, invited talk at 64th Gaseous Electronics Conference, Salt Lake City, Utah, November 14-18, 2011

2.45. I.V. Adamovich, J. Little, M. Nishihara, K. Takashima, and M. Samimy, “Nanosecond Pulse Surface Discharges for High-Speed Flow Control”, AIAA Paper 2012-3137 (invited), 6th AIAA Flow Control Conference, 25-28 June 2012, New Orleans, LA

2.46. I.V. Adamovich, W.R. Lempert, J.W. Rich, N. Jiang, A. Montello, M. Nishihara, and K. Takashima, “Experimental Characterization of Energy Transfer in Nonequilibrium Plasmas and High-Speed Flows”, invited talk at the 28th International Symposium on Rarefied Gas Dynamics, July 9-13, 2012, Zaragoza, Spain

2.47. I. Adamovich, J. Little, M. Nishihara, K. Takashima, and M. Samimy, “Nanosecond Pulse Surface Discharges for High-Speed Flow Control: Experiments and Modeling”, invited talk at 9th International Conference on Flow Dynamics, September 19-21, 2012, Sendai, Japan

2.48. I.V. Adamovich, “Challenges in kinetic modeling of energy transfer processes and plasma chemistry in ns pulse discharges”, seminar at the Institute for Fluid Science, Tohoku University, June 5, 2013, Sendai, Japan

2.49. I.V. Adamovich, “Challenges in kinetic modeling of energy transfer processes and plasma chemistry in ns pulse discharges”, invited talk at 66th Annual Meeting of APS Division of Fluid Dynamics, November 24–26, 2013, Pittsburg, PA

2.50. I.V. Adamovich, “Three-Dimensional Analytic Model of Coupled Vibrational-Rotational-Translational Energy Transfer in Diatomic Molecule Collisions”, AIAA Paper 2014-1442 (invited), 52st AIAA Aerospace Sciences Meeting (SciTech 2014), 13-17 January 2014, National Harbor, MD

2.51. I.V. Adamovich and W.R. Lempert, “Diagnostics and Modeling of Plasma Assisted Combustion Kinetics”, 41st EPS Conference on Plasma Physics, Berlin, Germany, June 23-27, 2014

2.52. I.V. Adamovich, S.B. Leonov, and V. Petrishchev, “Nanosecond Pulse Ionization Wave Discharges on Liquid Surfaces: Discharge Development and Plasma Chemistry”, seminar at Ecole Polytechnique, Paris, France, July 1, 2014

2.53. I.V. Adamovich and W.R. Lempert, “Diagnostics and Modeling of Plasma Assisted Combustion Kinetics”, seminar at Ecole Centrale, Paris, France, July 3, 2014

2.54. I.V. Adamovich and W.R. Lempert, “Diagnostics and Modeling of Plasma Assisted Combustion Kinetics”, seminar at Department of Aerospace and Mechanical Engineering, University of Southern California, September 17, 2014

2.55. I.V. Adamovich and W.R. Lempert, “Challenges in Understanding and Predictive Modeling of Plasma Assisted Combustion”, invited talk at 67th Gaseous Electronics Conference, November 2–7, 2014, Raleigh, NC, USA

2.56. M. Nishihara, I.V. Adamovich, W.R. Lempert, and J.W. Rich, “Effect of Accelerated Vibrational Relaxation on a Supersonic Shear Layer”, AIAA Paper 2015-0577 (invited), 53rd AIAA Aerospace Sciences Meeting (SciTech 2015), 5-9 January 2015, Kissimmee, Florida

2.57. I.V. Adamovich and W.R. Lempert, “Energy conversion in transient molecular plasmas: What happens with discharge input power before it becomes heat?”, invited lecture at the Aerospace Thematic Workshop “Fundamentals of Aerodynamic Flow and Combustion Control by Plasmas”, April 12-17, 2015, Les Houches – Mont Blanc, France

2.58. I.V. Adamovich, “Plasma Assisted Combustion, Plasma Flow Control, and Nonequilibrium Flows in Aerospace Propulsion”, invited lecture at 2015 International Graduate Summer School in Aeronautics and Astronautics, Beihang University, Beijing, China, July 14-22, 2015
2.59. I.V. Adamovich and W.R. Lempert, “Energy conversion in transient molecular plasmas: What happens with discharge input power before it becomes heat?”, seminar at the Institute of Electrical Engineering of Chinese Academy of Sciences, Beijing, China, July 22, 2015
2.60. I.V. Adamovich, "Energy conversion in transient molecular plasmas: implications for plasma flow control and plasma assisted combustion", plenary lecture at the 13th International Conference on Flow Dynamics, October 10-12, 2016, Sendai, Japan
2.61. I.V. Adamovich, "Energy conversion in transient molecular plasmas: implications for plasma flow control and plasma assisted combustion", seminar at Ohio University, November 4, 2016
2.62. I.V. Adamovich, S.B. Leonov, K. Frederickson, J.G. Zheng, Y.D. Cui, and B.C. Khoo, "Thermal perturbations generated by near-surface electric discharges and mechanisms of their interaction with the airflow", AIAA Paper 2017-1339 (invited), 55th AIAA Aerospace Sciences Meeting (SciTech 2017), 9-13 January 2017, Grapevine, TX
2.63. I.V. Adamovich, “Energy conversion in transient molecular plasmas: implications for plasma assisted combustion”, invited lecture at King Abdulla University of Science and Technology (KAUST) Research Conference: New Combustion Concepts, March 6-8, 2017, Jeddah, Saudi Arabia
2.64. I.V. Adamovich, "Electric field measurements in surface discharges in atmospheric air over solid and liquid dielectrics", invited talk at XXXIII International Conference on Phenomena in Ionized Gases (ICPIG) Estoril / Lisbon, July 9-14, 2017
2.65. I.V. Adamovich, "Electric Field Measurements in Plasmas by Ps Four-Wave Mixing and by Ps Second Harmonic Generation”, invited lecture at Electrical Engineering Institute of Chinese Academy of Sciences, Beijing, China, October 17, 2017
2.66. I.V. Adamovich, “Electric Field Measurements in Nanosecond Pulse Discharges in Air and in Hydrogen Flame”, invited lecture at 6th International Symposium on Jet Propulsion and Power Engineering, Beihang University, Beijing, China, October 16-18, 2017
2.67. I.V. Adamovich, "Electric Field Measurements in Nanosecond Pulse Discharges in Air and in Hydrogen Flame", invited talk at 14th International Conference on Flow Dynamics, Sendai, Japan, November 1-3, 2017
2.68. I.V. Adamovich, "Electric Field Measurements in Nanosecond Pulse Discharges in Air over Solid and Liquid Dielectric Surfaces", invited talk at 70th Gaseous Electronics Conference, Pittsburgh, PA, November 6-10, 2017
2.69. I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Electric Discharges", seminar at King Abdullah University of Science and Technology (KAUST), Jeddah, Saudi Arabia, November 16, 2017
2.70. I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Electric Discharges", seminar at Beihang University, Beijing, China, June 6, 2018
2.71. I.V. Adamovich, "Thermal Perturbations Generated by Near-Surface Electric Discharges and Mechanisms of their Interaction with the Airflow", seminar at Harbin Institute of Technology, Harbin, China, June 8, 2018
2.72. I.V. Adamovich, "Energy Conversion in Transient Molecular Plasmas: Implications for Plasma Flow Control and Plasma Assisted Combustion", seminar at Harbin Institute of Technology, Harbin, China, June 9, 2018
2.73. I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Electric Discharges", seminar at Harbin Institute of Technology, Harbin, China, June 10, 2018
2.74. I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Electric Discharges", seminar at Tsinghua University, Beijing, China, June 13, 2018

2.75. I.V. Adamovich, "Thermal Perturbations Generated by Near-Surface Electric Discharges and Mechanisms of their Interaction with the Airflow", seminar at Beihang University, Beijing, China, June 19, 2018
2.76. M. Simeni Simeni, Y. Tang, E. Baratte, K. Frederickson, W.R. Lempert, and I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Electric Discharges", invited talk at the Gordon Research Conference "Fundamental Insights in Plasma Processes", Bryant University, Smithfield, RI, August 5-10, 2018
2.77. I.V. Adamovich, "Electric Field Measurements in Nonequilibrium High Pressure Plasmas", Seminar at Laboratoire de Physique des Gaz et des Plasmas, Universite Paris Sud, September 28, 2018
2.78. I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Plasmas and Flames By Ps Four-Wave Mixing and Ps Second Harmonic Generation", Seminar at Laboratoire de Physique des Plasmas, Ecole Polytechnique, October 4, 2018
2.79. M. Simeni Simeni, Y. Tang, K. Frederickson, and I. Adamovich, "Electric Field Measurements in Nanosecond Pulse Discharges in Air and in Hydrogen Flame", invited talk at 15th International Conference on Flow Dynamics, Sendai, Japan, November 7-9, 2018
2.80. I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Plasmas and Flames By Ps Four-Wave Mixing and Ps Second Harmonic Generation", Seminar at GREMI (University of Orleans / CNRS research center), Orleans, France, November 12, 2018
2.81. I.V. Adamovich, "Electric Field Measurements in Atmospheric Pressure Plasmas and Flames By Ps Four-Wave Mixing and Ps Second Harmonic Generation", Seminar at CORIA (University of Rouen research center), Rouen, France, December 4, 2018
2.82. I.V. Adamovich, "Molecular Energy Transfer Processes in Nonequilibrium Hypersonic Flows", Seminar at ONERA (The French Aerospace Lab), Palaiseau, France, December 12, 2018
2.83. I.V. Adamovich, "Molecular Energy Transfer Processes in Nonequilibrium Hypersonic Flows", Seminar at DIFFER (Dutch Institute for Fundamental Energy Research), Eindhoven, The Netherlands, December 20, 2018
2.84. I.V. Adamovich, "Laser Diagnostics for Measurements of Electric Field and Excited Metastable Species in Nonequilibrium Plasmas and Reacting Flows", seminar at the Ohio Spectroscopy Institute, Ohio State University, January 18, 2019
2.85. I.V. Adamovich, "Laser Diagnostics for Measurements of Electric Field and Excited Metastable Species in Nonequilibrium Plasmas and Reacting Flows", seminar at King Abdullah University of Science and Technology (KAUST), March 11, 2019
2.86. I.V. Adamovich, "Laser Diagnostics for Measurements of Electric Field and Excited Metastable Species in Nonequilibrium Plasmas and Reacting Flows", seminar at School of Aeronautics and Astronautics, Purdue University, April 4, 2019
2.87. I.V. Adamovich, M. Simeni Simeni, Y. Tang, and K. Orr, "Laser diagnostics for electric field measurements in air plasmas, plasma-enhanced flames, and atmospheric pressure plasma jets", invited lecture at the XIII Frontiers in Low-Temperature Plasma Diagnostics Workshop, Bad Honnef, Germany, May 10-16, 2019
2.88. I. Adamovich, M. Simeni Simeni, and Y. Tang, "Electric field measurements in atmospheric pressure discharges for plasma-assisted combustion and plasma flow control applications", invited talk at the 24th International Symposium on Plasma Chemistry (ISPC), Naples, Italy, 9-14 June 2019
2.89. I. Adamovich, "Laser Diagnostics for Measurements of Electric Field and Excited Metastable Species in Nonequilibrium Plasmas and Reacting Flows", seminar at Department of Physical Electronics, Masaryk University, Brno, Czech Republic, October 17, 2019
2.90. I.V. Adamovich, "Understanding Reactivity of Nonequilibrium Molecular Plasmas for Propulsion and Power Applications", seminar at School of Aeronautics and Astronautics, Purdue University, October 23, 2019

2.91. I.V. Adamovich, "Electric Field Distribution Measurements In Plasma-Enhanced Flames", invited lecture at 16th International Conference on Flow Dynamics, Sendai, Japan, November 7, 2019
2.92. I. Gulko, E. Jans, C. Richards, N. Radomski, and I.V. Adamovich, "Selective Generation of Metastable Excited Species in Hybrid Plasmas for Plasma Chemistry and Plasma Catalysis Applications", invited lecture at 16th International Conference on Flow Dynamics, Sendai, Japan, November 8, 2019
2.93. I. Gulko, E. Jans, C. Richards, N. Radomski, and I.V. Adamovich, "Selective Generation of Metastable Excited Species in Hybrid Plasmas for Plasma Chemistry and Plasma Catalysis Applications", invited talk at AIAA Aerospace Sciences Meeting (SciTech 2020), 6-10 January 2020, Orlando, FL
2.94. I.V. Adamovich, "Understanding Reactivity of Nonequilibrium Molecular Plasmas for Propulsion and Power Applications", seminar at Department of Aerospace Engineering, University of Michigan, January 30, 2020
2.95. I.V. Adamovich, "Selective Generation of Metastable Excited Species in Ns Pulse and Hybrid Plasmas for Plasma Chemistry and Plasma Catalysis Applications", seminar at Sandia National Laboratory Livermore, February 12, 2020

Publications: Refereed Conference Papers and Preprints

3.1. I.V. Adamovich, V.I. Borodin, S.A. Zhdanok, and A.P. Chernukho, "Numerical Analysis of N_2 Isotope Separation Kinetics in Nonequilibrium Oxidation of Atmospheric Nitrogen", All-Union Conference "Mathematical Methods in Chemical Kinetics and Combustion", June 1990, Kyzyl, USSR
3.2. I.V. Adamovich, V.I. Borodin, S.A. Zhdanok, and A.P. Chernukho, "Numerical Simulation of Chemically and Vibrationally Nonequilibrium Molecular Gas Flows (N_2, O_2) in High Voltage Atmospheric Pressure Discharge", All-Union Conference "Mathematical Methods in Chemical Kinetics and Combustion", June 1990, Kyzyl, USSR
3.3. I.V. Adamovich, V.I. Borodin, S.A. Zhdanok, and A.P. Chernukho, "The Effect of Electronically Excited Molecules on N_2 Isotope Separation in Nonequilibrium Reactions of Atmospheric Nitrogen Oxidation", in "Thermophysics and Fluid Dynamics", ITMO Press, Minsk, USSR, 1990, pp. 90-94
3.4. I.V. Adamovich, V.I. Borodin, S.A. Zhdanok, and A.P. Chernukho, "Numerical Modeling of Oxygen Plasma of High Voltage Atmospheric Pressure Discharge. One-Dimensional Approach", in "Heat and Mass Transfer at Phase and Chemical Transformations", ITMO Press, Minsk, USSR, 1990, pp. 86-90
3.5. I.V. Adamovich, V.I. Borodin, and A.P. Chernukho, "Numerical Modeling of Oxygen Plasma of High Voltage Atmospheric Pressure Discharge", 20th International Conference on Phenomena in Ionized Gases (ICPIG), Pisa, Italy, June 1991
3.6. I.V. Adamovich, V.I. Borodin, A.P. Chernukho, S.G. Kruglik, et al., "CARS Diagnostics of High-Voltage Atmospheric Pressure Discharge", 20th International Conference on Phenomena in Ionized Gases (ICPIG), Pisa, Italy, June 1991
3.7. I. Adamovich, J. Hiltner, S. Macheret, and J.W. Rich, "Vibrationally-Induced Ionization of Carbon Monoxide in Optical Pumping Experiments", AIAA Paper 92-3028, 23rd Plasmadynamics and Lasers Conference, July 1992, Nashville, TN
3.8. M. Grassi, I. Adamovich, B. Zimering, S. Saupe, and W. Rich, "Infrared Emission Measurements in Laser Pumped NO", 48th International Symposium on Molecular Spectroscopy, June 1993, Columbus, OH

3.9. I.V. Adamovich, S. Saupe, M.J. Grassi, S.O. Macheret, and J.W. Rich, "Vibrational Kinetics and Ionization of Carbon Monoxide and Nitric Oxide in Optical Pumping Experiments", AIAA Paper 93-3199, AIAA 24th Plasmadynamics and Lasers Conference, July 1993, Orlando, FL
3.10. I.V. Adamovich, S.O. Macheret, and J.W. Rich, "Spatial Nonhomogeneity Effects in Vibrational Kinetics of Diatomic Molecules", AIAA Paper 94-2401, 25th AIAA Plasmadynamics and Lasers Conference, June 1994, Colorado Springs, CO
3.11. S.O. Macheret, A.A. Fridman, I.V. Adamovich, J.W. Rich, and C.E. Treanor, "Mechanisms of Nonequilibrium Dissociation of Diatomic Molecules", AIAA Paper 94-1984, 6th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, June 1994, Colorado Springs, CO
3.12. C.E. Treanor, I.V. Adamovich, and M.J. Williams, "Kinetics of NO Formation behind Shock Waves", International School-Seminar "Nonequilibrium Processes and Their Applications", September 1994, Minsk, Belarus
3.13. A.V. Saveliev, P.F. Ambrico, I.V. Adamovich, and J.W. Rich, "Vibrational Energy Transfer Among High Vibrational Levels of Nitric Oxide", International School-Seminar "Nonequilibrium Processes and Their Applications", September 1994, Minsk, Belarus
3.14. A.V. Saveliev, P.F. Ambrico, I.V. Adamovich, and J.W. Rich, "Vibrational Energy Transfer Among High Vibrational Levels of Nitric Oxide", AIAA Paper 95-0630, 33rd Aerospace Sciences Meeting and Exhibit, January 1995, Reno, NV
3.15. I.V. Adamovich, S.O. Macheret, A.A. Fridman, J.W. Rich, and C.E. Treanor, "New Models for V-T, V-V, and Nonequilibrium Dissociation Rates", NATO Advanced Study Institute "Molecular Physics and Hypersonic Flows", May 1995, Maratea, Italy
3.16. C.E. Treanor, I.V. Adamovich, and M.J. Williams, "Kinetics of Coupled Vibration-Dissociation behind Strong Shock Waves", NATO Advanced Study Institute "Molecular Physics and Hypersonic Flows", May 1995, Maratea, Italy
3.17. C.E. Treanor, I.V. Adamovich, M.J. Williams, and J.W. Rich, "Kinetics of NO Formation behind Strong Shock Waves", AIAA Paper 95-2061, 30th AIAA Thermophysics Conference, June 1995, San Diego, CA
3.18. I.V. Adamovich, S.O. Macheret, J.W. Rich, and C.E. Treanor, "Nonperturbative Analytic Theory of V-T and V-V Rates in Diatomic Gases, Including Multi-Quantum Transitions", AIAA Paper 95-2060, 30th AIAA Thermophysics Conference, June 1995, San Diego, CA
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