Frederick L. Dryer (PI)
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Brief Biography

Dr. Dryer is completing his 36th year as a tenured faculty at Princeton. Dr. Dryer has published over 140 archival articles, provided education experience for over 39 graduate students, 16 post doctoral students, and 4 professional research staff, many of whom populate industrial research and technical management positions at GE Aircraft, GE Global Research, General Motors, United Technologies, and Pratt and Whitney Aircraft. Others are faculty at major research institutions including Penn State, UCSD, UCD, and Cambridge. Dr. Dryer's principal research interests include a wide range of topics spanning fundamental and applied chemical kinetics of fuels, fire safety related issues on earth and in space exploration environments; solid phase/gas phase interactions as related to particle burning phenomena including carbon, coke, and metal particles; and combustion of heavy fuel liquids.

Relevant Experience and Interests

Dr. Dryer has extensive experience in developing and validating kinetic models for oxygenated hydrocarbons, and surrogate fuel (n-heptane/iso-octane/toluene) mixtures for replicating gasoline (funded by GM and HONDA, Japan). Methodologies for reproducing kinetic properties of real gasolines were developed based upon new validation data produced at Princeton and that appearing in the literature. Dr. Dryer's laboratory commonly utilizes the GAUSSIAN suite of programs to characterize potential energy surfaces, and multi-channel RRKM packages (ChemRate, MultiWell, and VARIFLEX) as well as in-house developed codes for rate coefficient estimation. In addition, his group has developed in house local and global sensitivity analysis-based codes for selecting experimental conditions to extract kinetic information to determine uncertainties in measured experimental rate constants, and to more generally analyze and compare system experimental observations with computations.

Five Publications Relevant to the Present Subject Area

1. M. Chaos, A. Kazakov, Z. Zhao, and F.L. Dryer (2007). "A High Temperature Chemical-Kinetic Model for Primary Reference Fuels," *Int. J. Chem. Kinet.* 39, 399-414.
2. J. Li, Z. Zhao, A. Kazakov, M. Chaos, F.L. Dryer, and Scire, J.J., Jr. (2007). "A Comprehensive Kinetic Mechanism for CO, CH_2O, CH_3OH Combustion," *Int. J. Chem. Kinet.* 39, 109-136.
3. A. Kazakov, M. Chaos, Z. Zhao and F.L. Dryer (2006). "Computational Singular Perturbation Analysis of Two Stage Ignition of Large Hydrocarbons," *J. Phys. Chem. A* 110, 7003-7009.
4. Z. Zhao, J. Li, A. Kazakov, and F.L. Dryer (2005). "Temperature-Dependent Feature Sensitivity Analysis for Combustion Modeling," *Int. J. Chem. Kinet.* 37, 282-295.
5. Z. Zhao, J. Li, A. Kazakov, S. P. Zeppieri and F.L. Dryer (2005). "Burning Velocities and a High Temperature Skeletal Kinetic Model For n-Decane," *Combust. Sci. Tech.* 177, 89-106.

Other Selected Publications

1. Z. Zhao, M. Chaos, A. Kazakov, P. Gokulakrishnan, M. Angioletti, and F.L. Dryer (2006). "Fuel Chemistry Models for Simulating Gasoline Kinetics in Internal Combustion Engine Applications," Work in Progress Poster 2C-27, Thirty-first International Symposium on Combustion, Heidelberg, Germany. August 6-12. Manuscript in preparation.
2. J. Li, A. Kazakov, and F.L. Dryer (2004). "Experimental and Numerical Studies of Ethanol Decomposition Reactions," *J. Phys. Chem. A* 108, 7671-7680.
3. Z. Zhao, J. P. Conley, A. Kazakov, and F.L. Dryer (2004). "Burning Velocities of Real Gasoline Fuel at 353 K and 500 K," SAE Paper No. 2003-01-3265. SAE Transactions.