



Exponent®
Engineering & Scientific Consulting

James Rundel, Ph.D., P.E.

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Professional Profile

Dr. Rundel specializes in combustion chemistry, thermodynamics, heat transfer, and energy systems. He is experienced in using a combination of experimental and modeling techniques to study the kinetics of combustion systems. Dr. Rundel leverages his expertise in these areas to investigate complex phenomena in thermal-fluid science, including combustion systems, fires, and energy system performance.

Dr. Rundel has experience conducting laboratory tests on various combustion experiments including premixed flames, diffusion flames, and flow-tube pyrolysis. He has used scanning mobility particle sizers (SMPS) along with a diverse set of mass spectrometry techniques (AMS, PIMS, GC-MS, and MALDI-MS) to analyze the physical and chemical characteristics of combustion-generated aerosols. Dr. Rundel also has experience using commercial and open-source software for quantum chemistry calculations (Gaussian), chemical kinetic modeling (CHEMKIN, Cantera), and data analysis (MATLAB, Igor Pro, Python). He also has experience with the design and testing of a custom radiative heating apparatus used for thermal treatment of biological samples.

Prior to joining Exponent, Dr. Rundel was a graduate researcher at the University of Colorado Boulder where he conducted research in the field of combustion chemistry, specifically carbonaceous-particle (soot) formation. His research used aerosol mass spectrometry coupled with vacuum-ultraviolet photoionization to identify and characterize chemical species involved in particle formation to elucidate the mechanisms driving soot formation in combustion system. During his earlier graduate work, Dr. Rundel investigated novel methods of sample preparation for MALDI-MS imaging using thermal denaturation via radiative heating, resulting in a patent. Dr. Rundel also has experience in the utility industry. He has worked in the areas of natural gas distribution, energy services/management for large electric accounts, and operations and maintenance for power plants (coal-fired and natural gas combined cycle).

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Colorado, Boulder, 2023

M.S., Mechanical Engineering, University of Wyoming, 2018

B.S., Energy Systems Engineering, University of Wyoming, 2014

Licenses and Certifications

Professional Engineer Mechanical, California, #M42172

Professional Engineer, Colorado, #PE.0064210

FI-210, Wildland Fire Origin and Cause Determination

Certified Fire and Explosion Investigator (CFEI)

Fire Investigation 1A (Cause and Origin), California Office of State Fire Marshal (CA)

Prior Experience

Rotational Engineer, Black Hills Corp., 2014-2016

Professional Affiliations

American Chemical Society (member)

American Society of Mechanical Engineers (member)

American Association for the Advancement of Science (member)

Patents

US Patent No. 11205565, Belmont, E., Basile, F., Rundel, J., Goodenough, A., Non-intrusive laser-based technique for monitor and control of protein denaturation on surfaces, December 2021

Publications

Rundel, J., Martí, C., Zádor, J., Schrader, P., Johansson, K., Bambha, R., Buckingham, G., Porterfield, J., Kostko, O., Michelsen, H. The identity and chemistry of C₇H₇ radicals observed during soot formation. The Journal of Physical Chemistry A, 127 (13), 2023; 3000-3019.

Rundel, J., Johansson, K., Schrader, P., Bambha, R., Wilson, K., Zádor, J., Ellison, G., Michelsen, H. Production of aliphatic-linked polycyclic hydrocarbons during radical-driven particle formation from propyne and propene pyrolysis. Combustion and Flame (In Press), 2022; 112457.

Rundel, J., Thomas, C., Schrader, P., Wilson, K., Johansson, K., Bambha, R., Michelsen, H. Promotion of particle formation by resonance-stabilized radicals during hydrocarbon pyrolysis. Combustion and Flame (243), 2022; 111942.

Presentations

Rundel, J., Insights into Soot Formation Chemistry from Aerosol Mass Spectrometry Coupled with Synchrotron VUV Photoionization, 5th QUADMARTS Conference, Estes Park, CO, June 2023

Rundel, J., Thomas, C., Johansson, P., Schrader, P., Bambha, R., Zádor, J., Wilson, K., Michelsen, H., Solving Soot: Resonance-Stabilized Radicals and the CHRCR Mechanism (Poster), Sandia National Laboratories Research Day, Boulder, CO, August 2022.

Rundel, J., Schrader, P., Wilson, K., Johansson, O., Michelsen, H., Links Between Resonance-Stabilized Radicals & Sooting Onset in Pyrolysis Experiments (Poster), International Sooting Flame Workshop 5, January 2021.

Goodenough, A., Rundel, J., Basile, F., Belmont, E., Radiative Heating Thermal Decomposition/Digestion for On-Tissue Digestion of Proteins for Imaging-MALDI-MS, Proceedings of the 66th ASMS Conference, San Diego, CA June 2018.